AL ADWAA

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SCIENCE

FIRST TERM

4th PRIM.

2022



Contents

Theme One: Systems

Unit One: Living Systems

Concept 1 Adaptation and Survival

Concept 2 Senses at Work

Concept 3 Light and Sight

Concept 4 Communication and Information Transfer





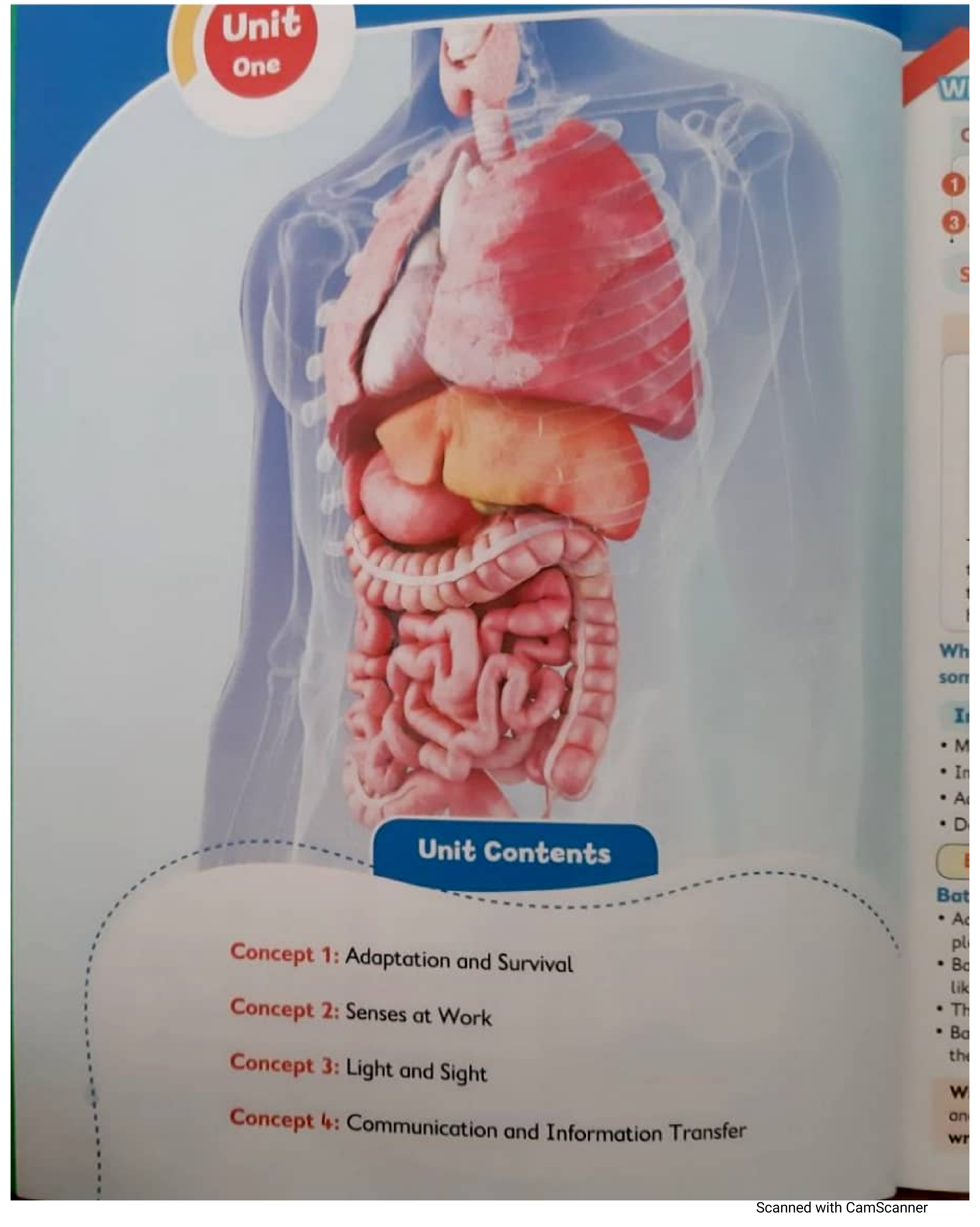
Theme Two: Matter and Energy
Unit Two: Motion

Concept 1 Starting and Stopping

Concept 2 Energy and Motion

Concept 3 Speed

Concept 4 Energy and Collision



Unit Contents

What I Already Know

Challenges that face the living organisms in their environments:

1. Hot and cold temperatures
2. Too much or too little water
3. Availability of food
4. Availability of shelter
5. Survive from predators

So, animals and plants adapt or change overtime in order to live, eat, breathe, stay safe, and so on.

Examples:



The arctic fox has white fur to overcome the low temperature in the polar habitat.



The camel's body is covered with a thick hairy hide which protects it from the heat of the Sun and sand storms.



Palm trees have strong roots to keep on their life from high winds in desert.

While humans can adapt by different ways in order to survive in their environment sometimes by changing their behaviors or their life style or even the way they dress.

In this unit we will study:

- Methods of adaptations of living organisms.
- Investigate how humans and animals use senses to gather information and navigate or get around.
- Adaptations of nocturnal animals.
- Determine adaptations of how animals communicate and transfer information.

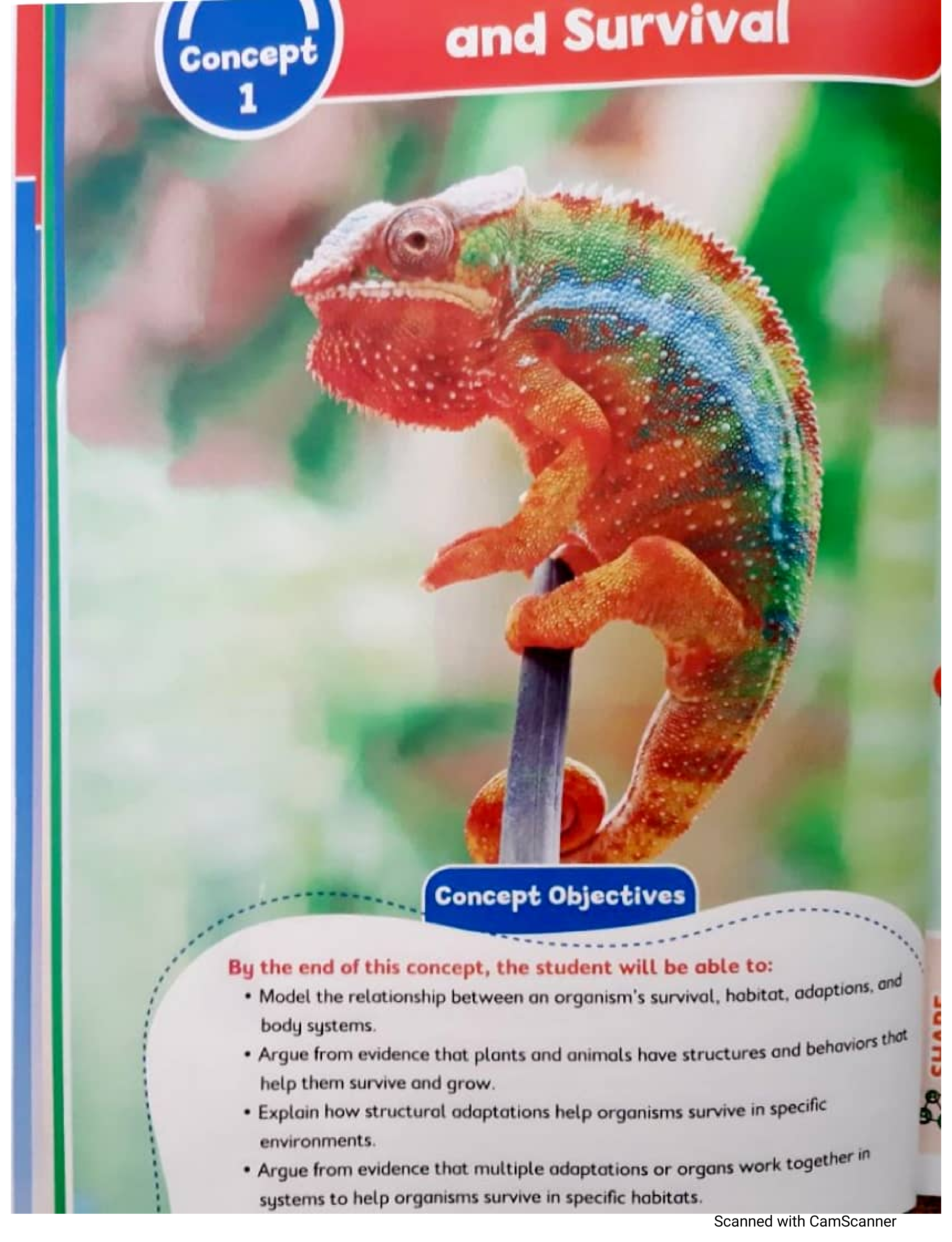
Examples:

Bats



- Actually, bats are pretty important to both humans and other living organisms and play specific roles in the ecosystem. They are not scary at all.
- Bats sleep upside down, they have a structural adaptation that allow them to fly like birds, eat mosquitoes and other insect.
- They help plants and flowers similar to bees and butterflies.
- Bats are nocturnal, they are most active at night but they cannot see well at night, they can navigate using a very cool adaptation called echolocation

Write some questions you can ask to learn more about bats and how they avoid obstacles and find prey. As you will learn adaptations and senses in this unit, **write** the answers to your questions to help you in your unit project.



Concept 1

and Survival

Concept Objectives

By the end of this concept, the student will be able to:

- Model the relationship between an organism's survival, habitat, adaptions, and body systems.
- Argue from evidence that plants and animals have structures and behaviors that help them survive and grow.
- Explain how structural adaptations help organisms survive in specific environments.
- Argue from evidence that multiple adaptations or organs work together in systems to help organisms survive in specific habitats.

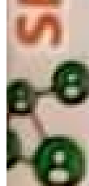
"Pacing Guide"

Lesson	Activity	Key Terms	Life Skills
1	**1 Can You Explain?** • Students use prior knowledge to construct an explanation of how animals and plants use adaptations to survive extreme climates.	Survive - Adaptation - Reproduce Arctic - Ocean	Endurance
	2 Penguin • Student will gather information and discuss how penguins' feet can help them survive in the coldest habitats. And they'll ask questions concerning the adaptation methods to search for along the concept.	Arctic - Antarctica - Weave	Negotiation
	3 Adaptations for Survival • Students read an informational text and develop questions about the relationships between an organism's environment, adaptations, and survival.	Ecosystem - camouflage	———
2	**4 Types of Adaptations** • Students record evidence of behavioral and structural adaptations in animals that live in extreme environments.	Structural - Behavioral	———
	5 The Panther Chameleon • Students construct explanations about how different types of adaptations help the panther chameleon survive.	prey	———
3	**6 Plant Adaptations** • Students gather evidence and discuss adaptations of the acacia tree and the kapok tree.	———	———
	7 Plant Scientist • Students collect data on plants in specific environments and use that data as evidence to argue that those plants may have adapted to their environment over time.	———	Decision-Making
	8 Identifying Adaptations • Students identify plant structures that have functions that help the plant survive.	———	Critical Thinking
4	**9 Digestive System** • Students explore how the digestive system can be described in terms of its component organs and learn that these digestive organs work together as a system.	Digestive system - Energy	———
	10 Body Systems • Students communicate how internal structures, such as the digestive system, help animals survive.	———	———
	11 Respiratory System • Students explore the parts and functions of the respiratory system and study how these parts work together and adapt as a system.	Respiratory system	———
5	**12 How Fish Breathe** • Students compare the structures of respiratory systems of a fish to those of a human.	———	Decision-Making
	13 Humans Change the Environment • Students identify causal relationships between humans and the environment and how living things adapt to environmental changes.	Pollute	———
6	**14 Record Evidence: Penguin** • Students construct explanations about how living things use adaptations to survive in an environment.	———	Creativity
	15 STEM in Action • Students obtain information about the work of conservation biologists and evaluate the information to communicate why researchers study adaptations in endangered amphibians. Students, then design a public service message to advocate for clean waterways.	Amphibians Extinct Endangered Species	Problem-Solving
	16 Review: Adaptation and Survival • Students will summarize their learning about adaptations via a written ... and by completing a concept summative assessment.	———	Self-Management

WONDER

LEARN

SHARE

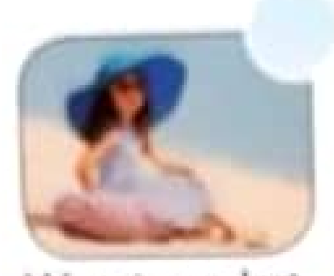




Lesson 1 ① Can You Explain?

Warm-up

- When the weather is very hot and sunny, what do you do to avoid the high temperature?


Wearing a hat


Wearing heavy clothes


Sitting in the shade of a tree

So, we conclude that human and other living organisms can carry out different ways to adapt to the surrounding environment to survive.

Example:

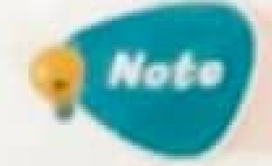
Desert lizard "Agama Lizard"

- **Habitat:** Desert which is hot and dry, so it suffers from the high temperature.


Habitat: is the environment where living organisms normally live and grow.

How does agama lizard keep its body cool in hot, dry climate?

- It keeps its body cool by finding shade during hot and sunny days.


To adapt: means to overcome the hard environmental condition.

Parents' Tips:

Help your child remember the previous knowledge to explain how animals and plants use adaptation methods to survive in the extreme climatic conditions.



Many ani

Example

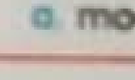
Camel

Reptiles a
rodents.
Ex: Snake a
jerboa

Panting
species
Ex: dogs an
foxes.

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Many animals have special methods of keeping themselves cool in hot desert.

Examples:

Animals	Habitat	Method of adaptation
Camel	• Desert	• It is characterized by having hump on its back, which helps it to store fat that is rich in energy to survive.
Reptiles and rodents. Ex: Snake and jerboa	• Desert	• They take shelter from the high temperature under a rock or sand and come out in the sunset.
Panting species Ex: dogs and foxes.	• Desert	• They lower their bodies temperature by panting.

Apply Like a Scientist

(Answer Guide P. 2)



Choose the correct answer

1- Camel is characterized by having hump to ....

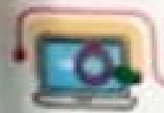
a. survive   b. store fats   c. (a) and (b)

2- Agama lizard feels .... under shadow.

a. high temperature
b. moderate temperature
c. low temperature

3- Reptiles hide under .... and .... to avoid the high temperature.

a. moonlight and rocks   b. rocks and sand   c. sunlight and sand



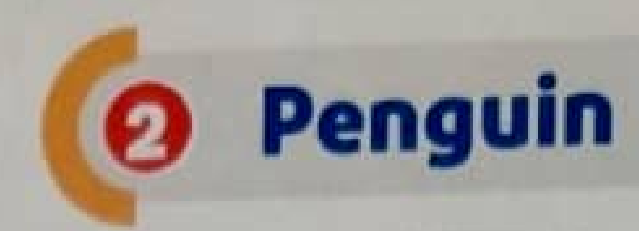
Search the internet



Look at the picture of the bat, notice it has a feature that helps it detect the steps of small insects.

Ask a question to find out, what this feature is. Search the internet about the features of the bat.





2 Penguin

Activity  **Ask Questions Like a Scientist**

 **Warm-up**

- If you hold a piece of ice in your hands or if you stand on a sheet of ice in bare foot.
  - a. You would lose feeling in your toes or hands after only a couple of minutes. ☐
  - b. No changes occur. ☐

So, climate is one reason many living organisms adapt over generations.
Can living organisms survive in extreme cold temperature?

 **1 Polar animals and adaptations:**

Example: **Penguin**

- Unlike most birds, penguins cannot fly but they can stand on ice all day and can survive in their habitat.

Habitat
Penguins in Antarctica live in a polar climate that is one of the coldest places on the Earth.

Its body
Penguin's body is covered by dense feathers and a thick layer of fat to keep it warm.

Its feet
Penguin's feet are not covered in feathers.



Parents' Tips:
Help your child gather information and discuss how penguins' feet can help them survive in the coldest areas on the Earth's surface.



2 Adaptation of penguin's feet:

- The penguin's feet stay warm because of the way of blood flowing throughout the blood vessels within its feet.

How do the penguin's feet stay warm?

Blood vessels

Cold blood in the feet

Warm blood in the rest of the body

These blood vessels touch each other, so the heat transfers from the hot blood vessels to the cold ones.

The blood traveling up into the body is not cold, and blood flowing down to the toes is warm enough to keep their toes from freezing.



Conclude Like a Scientist

- **How do the penguins' feet help them survive in the cold climate?**

Answer

Blood vessels carrying warm blood from the warm parts of the penguin's body weave around the blood vessels carrying blood from the cold feet. This warms the blood vessels that need it.

Apply Like a Scientist

(Answer Guide P. 2)



Choose the correct answer

1- Penguin's feet stay .... while walking on ice.

a. warm b. cold c. freezing

2- The blood that flows throughout the penguin's body while walking on ice is ....

a. warm b. cold c. frozen

3- Which of the following methods help animals to adapt with low temperature in cold places?

a. Their bodies are covered with scales.

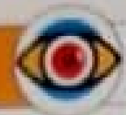
b. Their bodies are covered with dense feathers.

c. Their bodies are covered with skin.



WONDER

3 Adaptations for Survival



Activity — Observe Like a Scientist



Warm-up

- Do you know that the fur color of some animals changes according to the season in order to adapt to different environmental conditions?

So, living things have some characteristics that help them survive.

Adaptations

- They are the characteristics that help living organisms survive and reproduce in the ecosystem where they live.

Examples:

1


Polar bear

- **Habitat:** Arctic which is cold and snowy.
- **The white thick fur:**
  - Helps the polar bear stay warm in cold places.
  - Helps polar bears blend in with the snow as they sneak up on their prey.

2





Black bears — **Brown bears**

- **Habitat:** Forests
- **The black and brown fur:**
  - Help them stay hidden among the trees as they hunt.

Parents' Tips:

Help your child observe and ask questions about the relationship between the living organisms' habitat and the ways to adapt in order to survive.

3





Caracal **Fennec Fox**

- **Habitat:** Desert
- **Sandy-colored fur:**
  - Helps them blend in with the desert landscapes.

4

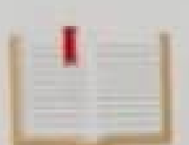


Desert Lizard

- **Habitat:** Desert
- **Have colorful scales:**
  - To hide among the quite colorful rocks in the desert.



Animals adapt in many ways to help them hide from predators or attack their preys by a method of adaptation that is called **camouflage**.



Definition

Camouflage:

- It is a type of adaptation that animals use to hide from **predators** or their **preys**.



Apply Like a Scientist

(Answer Guide P. 2)



Complete the following sentences:

1- The fennec fox lives in .... habitat.

2- The polar bear has .... on its body.

3- .... is the type of adaptation that animals use to hide from predators or their preys.

Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 2)

1 Choose the correct answer:

1. .... is a type of adaptation that helps the polar bear hide among snow to hunt and avoid being hunted.
   a. Camouflage   b. Adaptation   c. Habitat
2. Penguin has .... to help it keep its body warm.
   a. skin   b. feathers   c. scales
3. Agama lizard keeps its body cool in hot climates by ....
   a. covering its body with water in the bonds   b. searching for shades or hide in burrows
   c. changing the color of its scales according to the surrounding environment

2 Match:

1.	Caracal has sandy-colored fur	a. to keep its body warm in cold places.
2.	Camel has humps on its back	b. helps it to hide in the desert.
3.	Polar bear has white thick fur	c. which helps it to store fat that are rich in energy to keep its survival.

3 Complete the following sentences using the given words:

(brown – Antarctica – white – forest – desert)

1. The penguin lives in ....
2. Camel lives in ....
3. The bear that lives in forest has .... thick fur.

4 "True" or "False":

1. Penguin's feet freeze when it walks on ice. (..................)
2. Camel has hump to protect its back from extremely hot sunlight. (..................)
3. Brown bear lives in a tropical habitat and its brown fur helps it hide among trees. (..................)
4. Camouflage is a type of adaptation that helps animals hide from predators. (..................)





LEARN



Lesson 2 4 Types of Adaptations



Activity Analyze Like a Scientist



Warm-up

- What happens if the living organisms can't adapt to the environmental conditions?

  a. Living organisms will not survive. ☐

  b. Living organisms will survive. ☐





1 Types of adaptation:

Definition

Adaptation:

- It is a change in the characteristics of a living organism that helps it survive "live" in its habitat and cope with environmental changes in order to survive.

Structural adaptation

It is a change in the body of the living organism.



Behavioral adaptation

It is a change in the way a living organism behaves or acts.

Parents' Tips:



LEARN



2 Unique survival strategies in some amazing animals:

- Let's explore the types of adaptation in different living organisms.

Examples:

1. Fennec fox:

- **Habitat:** Desert which is characterized by hot and dry climate and it is hard to get foo

Adaptation type:	Structural Adaptation	Behavioral adaptation
Adaptation Method Fennec fox	• It has a tan-colored coat which ▸ provides camouflage in a sandy, rocky environment. ▸ protects it from the scorching hot sun. • It has extra-long ears which ▸ help in cooling its body. ▸ strengthen hearing sense to help it hunt	• It cools its body by panting; it breathes 700 breaths per minute. • It lives in burrows to keep its body cool during daytime. • It has varied diet. Because (It eats all kinds of food including insects, fruits, plants roots, even the remains from other animal's prey.)

2. Arctic fox:

- **Habitat:** Tundra desert, with temperatures as cold as –50°C in the winter months and it is hard to get food.

Adaptation type:	Structural Adaptation	Behavioral adaptation
Adaptation method Arctic fox	• Its white thick fur: ▸ Keeps it warm. ▸ Helps it hunt even in deep snow. • The white thick fur turns into brown fur in summer, when the snow melts to hunt. • Has short ears and legs which: ▸ Help it stay warm.	• Lives in burrows to: ▸ Keep its body warm at night. • It has varied diet. Because (it eats all kinds of food including insects, fruits, plants roots, even the leftovers from other animal's prey.)

3. Bull shark:

- **Habitat:** It lives in salty water "seas" and adapted to live also in fresh water.

Adaptation type:	Structural Adaptation	Behavioral adaptation
Adaptation method Bull Shark	• Its body has adapted to live in the fresh water also, where no other sharks, so there is less competition to find food. • Uses a camouflage strategy called **countershading.** (Has a dark back and white belly). ► To sneak up on preys.	• It has varied diet. Because (it eats all kinds of fish) • It hunts its prey in unexpected times. Because It hunts by the day as well as at the night, allowing it to surprise its prey.



The countershading:
An animal swimming above in the ocean may not see the shark in the shadows. To an animal swimming underneath the shark and looking up, the bull shark may blend in with the bright light of the Sun.



Apply Like a Scientist *(Answer Guide P. 2)*

A. Choose the correct answer:

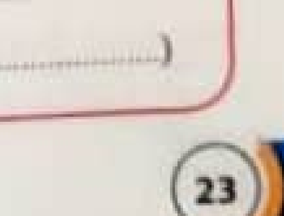
1. The bull shark has adapted to live in ....
   a. salty water only b. fresh water only c. salty and fresh water
2. The fish and marine animals that swim under the bull shark can't see it due to ....
   a. its countershading b. its bright colors c. light separation

B. Give reason for each of the following:

The importance of the fennec fox's tan-colored coat.
....

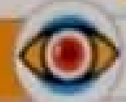
C. Write the adaptation type of each of the following:

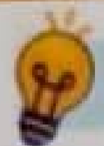
1. Sharp teeth of the bull shark to cut flesh. (..........)
2. The long arms of monkey to climb trees. (..........)
3. Hiding some animals in burrows during daytime in a hot climate. (..........)
4. The countershading strategy of the bull shark. (..........)
5. Fennec fox lives in burrows to keep its body warm. (..........)





5 The Panther Chameleon

Activity  **Observe Like a Scientist**



Warm-up

- Lizards are cold - blooded - animals that can cool their bodies in hot climate and covered with scales.
- What adaptations does panther chameleon have to survive in its habitat?

1 The Panther Chameleon adaptation:

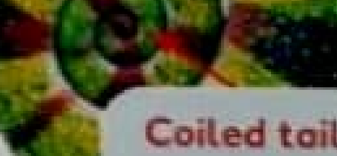
- **Habitat:** Tropical rainforest which is rainy and warm.

Chameleon eyes:
Face opposite directions and can move independently of each other. One eye can be searching for food, while the other lookout for danger in a totally different direction.

Colorful shiny scales:
Help chameleon hide between green leaves and colorful flowers.

V-shaped feet:
To hold tightly to branches and vines.





Coiled tail:
Helps it to catch things.

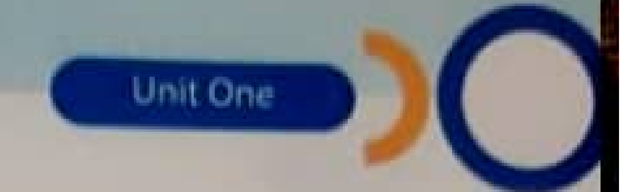


Conclude Like a Scientist

- The panther chameleon can catch its prey and avoid becoming one at the same time.

Answer: Because it can look for food with one eye, while its other eye looks in a different direction to avoid danger.

Parents' Tips:
Help your child observe and explain how different methods of adaptations help the panther chameleon to survive.



2 What happens if the chameleon finds itself in danger?

- As it has no teeth or claws to defend itself, its last trick to look fierce is as follows:

1. It puffs up its body with air to look bigger.
2. It opens its mouth to look wide.
3. It changes its scales colors.
4. It looks at different directions to monitor the danger in order not to be a prey.





So, this display will probably scare the attackers.

Conclude Like a Scientist:

- **Data Table: Evidence of Adaptations in Living Organisms (Panther Chameleon).**

Answer

Adaptation way	Adaptation type	How does adaptation help the panther chameleon?
• Vivid colors	• Structural adaptation	• Hiding and hunting
• V-shaped like feet	• Structural adaptation	• Balance and motion
• Eyes move in different directions	• Structural adaptation	• Hunting
• The puffing body	• Behavioral adaptation	• Scare attackers
• Wide open mouth	• Behavioral adaptation	• Scare attackers
• Changing colors	• Behavioral adaptation	• Defend or survive

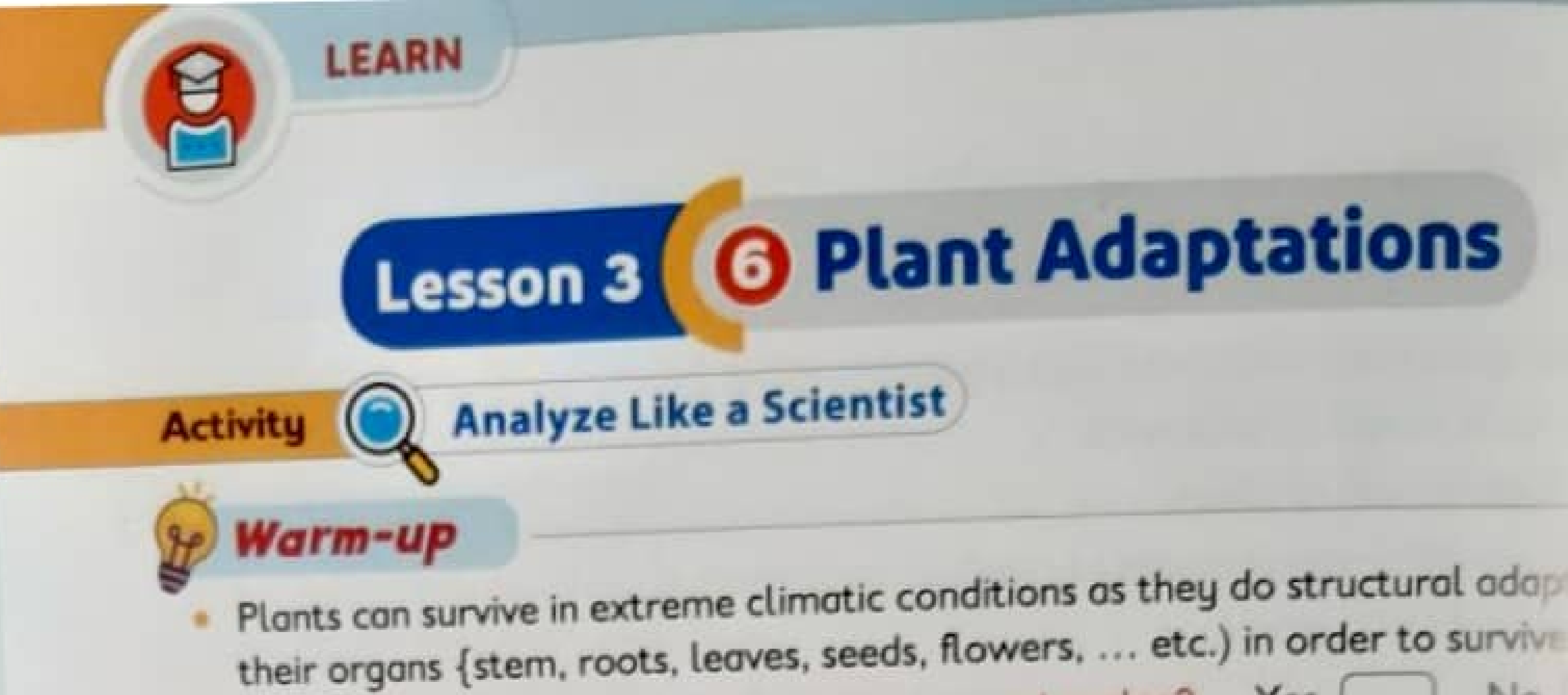
Apply Like a Scientist

(Answer Guide P. 2)



Complete the following sentences:

1. .... helps the panther chameleon to frighten its enemies and survive.
2. .... helps the panther chameleon to balance and attach to tree branches.
3. .... helps the panther chameleon to hunt preys without being a prey at the same time.
4. .... helps the panther chameleon to hide in the green leaves and colorful flowers.



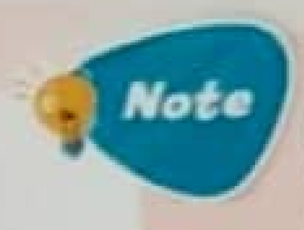
Warm-up

- Plants can survive in extreme climatic conditions as they do structural adaptation in their organs {stem, roots, leaves, seeds, flowers, ... etc.) in order to survive.
- Could plants do behavioral adaptation to survive also? Yes ☐ No ☐

- Plants grow in almost every place that sunlight shines, even the bottom of sea ice in polar regions has tiny plants growing on it.



Two Terrific Trees



Note The temperature in this grassland habitat is mild, but the lack of water is extreme during the dry seasons.

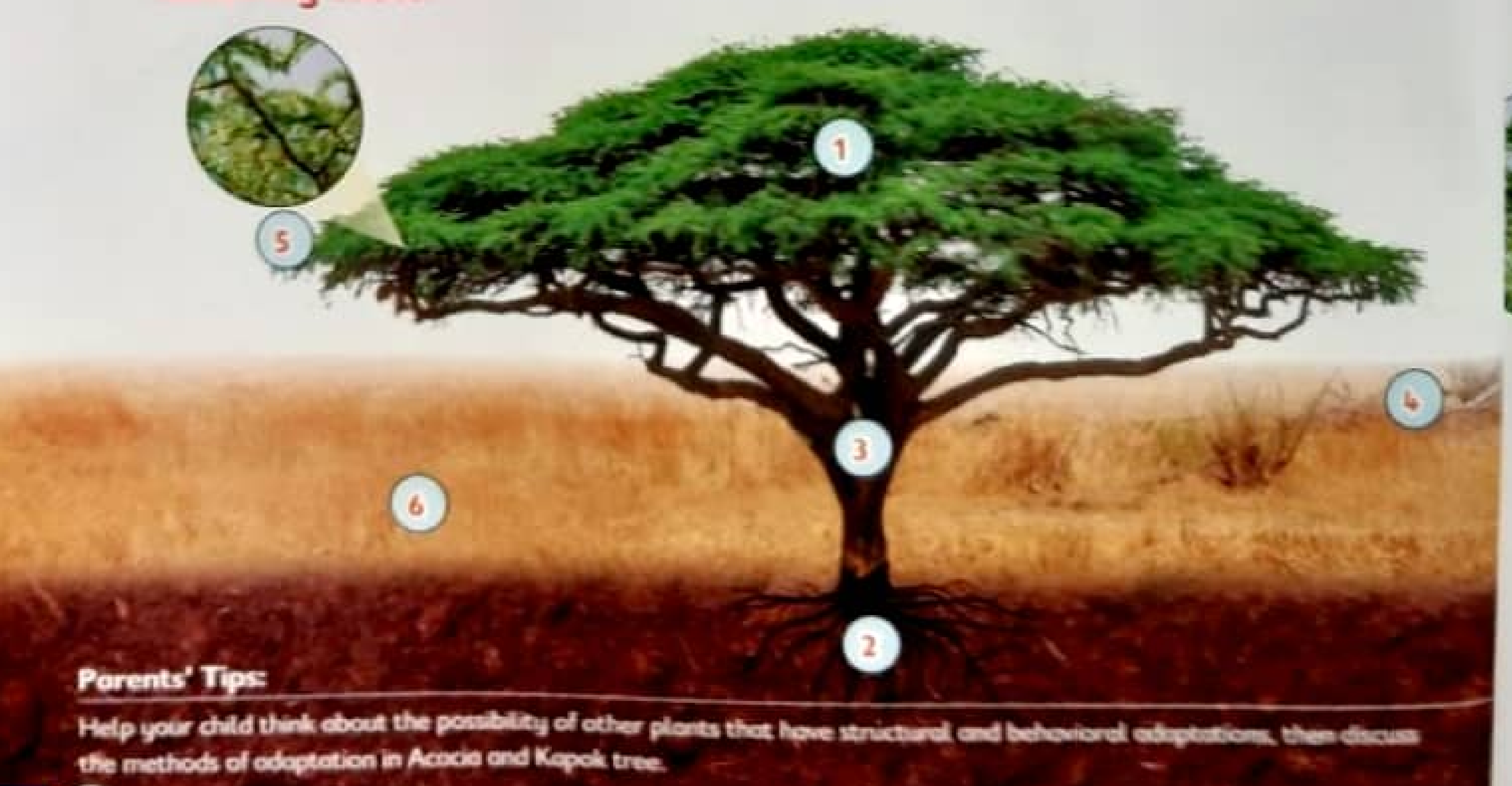
Examples:

1. Acacia Tree

Habitat: Southern African Savannah

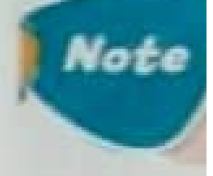
- There is one large tree that can be seen scattered throughout the landscape.
- This is an acacia tree which is built to survive through many months of drought.

Let's explore the adaptation of the labeled parts of the Acacia tree in the following table:



Parents' Tips:

Help your child think about the possibility of other plants that have structural and behavioral adaptations, then discuss the methods of adaptation in Acacia and Kapok tree.



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How can Acacia tree survive through long drought months?

Kind of Adaptation	Characteristics	Reason
Structural Adaptation	1. Umbrella-shaped top with small leaves.	Help hold in water while soaking up sunlight needed to make food.
	2. Taproot: "One of the longest main roots"	To look for water as deep as 35 meters below the surface.
	3. Tree trunk.	Stores water in it.
	4. Tall length tree.	Animals can't eat its leaves (except giraffes).
	5. Spines around the leaves.	To protect it from plant-eater animals.
Behavioral Adaptation	6. Produces poison when animals eat them.	To let the leaves taste terrible to keep away from plant-eaters.
	7. Sends a smelly message in the wind.	To warn trees around it to produce the same poison (warn signals).

2. Kapok Tree

- **Habitat: Amazon Rainforest of Brazil.**

Note Rainforest is rainy all year long and the presence of huge trees prevent much of the sunlight from reaching the ground.

Let's explore the adaptation of the labeled parts of the Kapok tree in the following table:

LEARN

How can kapok tree survive and stay upright in soggy soil?

Kind of Adaptation	Characteristics	Reason
Structural Adaptation	1. Exceeds 70 meters length and has umbrella- shaped top.	▶ To reach the sunlight.
	2. Hand-shaped leaves with narrow parts.	▶ To allow wind to move more gently through the leaves or not get torn by wind.
	3. Buttress roots: "Roots begin high up on its trunk, and can start up to 5 meters above ground."	▶ Holding the tree securely in place.
	4. Fluffy yellow light seeds.	▶ To be easily carried by the wind.
Behavioral Adaptation	5. Delicious-smelling flowers.	▶ To attract bat towards it. ▶ To send messages.

Conclude Like a Scientist

- **Acacia tree and Kapok tree have behavioral adaptations.**

Answer

As they: a. have delicious-smelling flowers to attract other living organisms "Bats"
b. produce poison pumped among their organs.
c. send warn signals by different means to other trees in order to protect themselves against plant-eaters.

Search the internet

- Search about more plants in different habitats, then list some of their structural and behavioral adaptations, then discuss them with your classmates.

Apply Like a Scientist

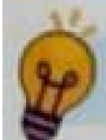
Put (✓) or (✗): *(Answer Guide P. 2)*

1. Acacia tree doesn't have behavioral adaptations methods. ( )
2. Sending warn signals from Kapok tree to another is a behavioral adaptation method. ( )
3. Buttress roots of kapok tree is a structural adaptation method. ( )
4. Spines around the tree branches of Acacia, protect it from being eaten is a structural adaptation method. ( )
5. Fluffy seeds of kapok tree that carried by wind, or other living organisms is a structural adaptation method. ( )

7 Plant Scientist



Activity — Think Like a Scientist



Warm-up

- Botanist is the scientist who studies plants, collect data about plant characteristics and how they adapt overtime to survive.

Plants structural adaptions to survive in their extreme climatic conditions:



Examples:

1- Palm tree



- Habitat: Desert
- Weather: Dry and hot

Adaptation Method

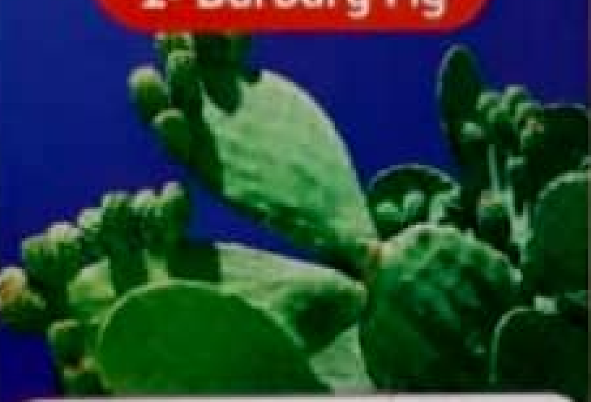
- Thick trunk
- Narrow leaves



Reason

- To prevent the tree from damage in a windstorm.

2- Barbary Fig



- Habitat: Desert
- Weather: Dry and hot

Adaptation Method

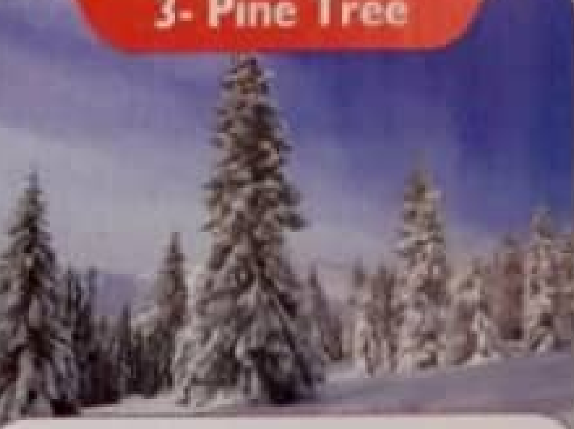
- Sharp spines and tough outer covering



Reason

- Hard to be eaten by animals

3- Pine Tree



- Habitat: Polar
- Weather: Cold and snowy

Adaptation Method

- Needles instead of leaves.



Reason

- To prevent water loss.

Adaptation Method

- Short triangular branches.



Reason

- Let the snow slides easily so branches don't break.

arents' Tips:

elp your child apply what he/she knows about plant parts and their methods of structural and behavioral adaptations, by ɔserving images to think about evidence of adaptations in their habitats.



LEARN

4- Waterlily



- Habitat: Aquatic" Fresh water"

Adaptation Method

- Wide and floaty leaves.



Reason

- To absorb (soak up) as much sunlight as possible.

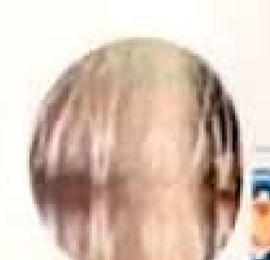
5- Mangrove tree



- Habitat: Aquatic" Salty water"

Adaptation Method

- Long and strong roots.



Reason

- To hold on in the waves.



Conclude Like a Scientist

- **What happens if plants were placed in a different environment?**

Answer

They would struggle to meet their basic needs in order to survive or they may not survive

Apply Like a Scientist

(Answer Guide P. 2)

Choose the correct answer:

1. Barbary fig has spines to ....
   - a. protect itself from plant-eaters
   - b. minimize water loss
   - c. die
   - d. (a) and (b)
2. Pine trees has .... to slide the snow easily over it.
   - a. thick and broad branches.
   - b. triangular branches
   - c. flat leaves
   - d. all the previous
3. Waterlilies have wide flat leaves to ....
   - a. absorb sunlight as possible
   - b. lose water
   - c. protect itself from plant eaters
   - d. No correct answer
4. Mangrove trees need .... to with stand in front of strong waves.
   - a. thin and short roots
   - b. short and thick roots
   - c. thick and long roots
   - d. No correct answer



Activity

Warm

Adaptati

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Example

Long and br undergroun

Small or sp the water l

Short stem d

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Apply L

Fill in the

(structu

1. Plants
2. In dese
3. Tropica
4. ....
5. Plants
6. Plants

ents' Tips:

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8 Identifying Adaptations

Activity  **Evaluate Like a Scientist**

Warm-up

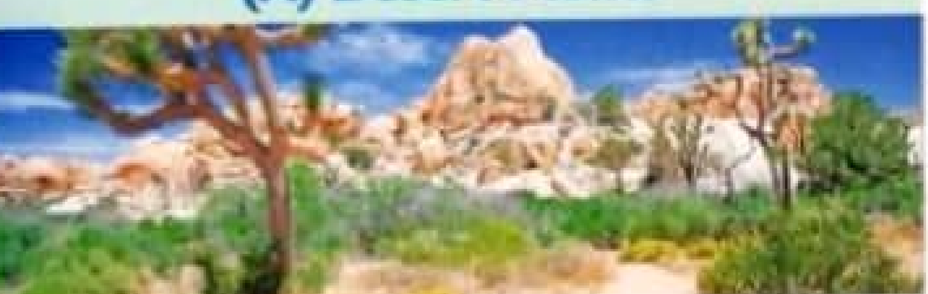
- Adaptation may affect the size, shape and structure of the plant organs.
- Do plants that live in the same habitat may share the same adaptation methods in order to survive?

Yes ☐ No ☐



Plant structural adaptations in different habitats:

Examples:

	(A) Desert Plants	(B) Rainforest Plants
		
	Characteristic	**Characteristic**
Roots	Long and branched roots to collect underground water as much as possible.	Buttress roots to fix itself in muddy soil.
Leaves	Small or spiked leaves to minimize the water loss.	Large flat leaves to absorb the possible amount of sunlight..
Stem	Short stem due to the shortage of water. Store water in their stem.	Long trunks to compete for sunlight.

Apply Like a Scientist

(Answer Guide P. 2)

Fill in the blanks:

(structural - shortage - Thorns - deep - adapt- thin- wide - branched - behavioral)

1. Plants .... in order to live in extreme climatic conditions.
2. In desert habitats, ... and .... roots search for underground water.
3. Tropical plant leaves are .... to collect light as much possible.
4. .... and nasty taste protects plants against plant-eaters.
5. Plants do .... and .... adaptations in order to survive.
6. Plants don't grow very tall in desert habitats due to .... of water.

arents' Tips:

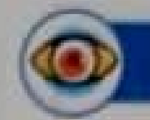
elp your child evaluate what he/she learnt about adaptation methods in plants, that enables them adapt to different vironmental conditions and survive in their habitats.

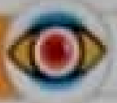




LEARN

Lesson 4 (9) Digestive System



Activity  Observe Like a Scientist



Warm-up

- Each living organism has the ability to carry a variety of life processes through differen body systems that work together in harmony.
- Does food for living organisms have the same importance as fuels for the car?

Yes ☐ No ☐

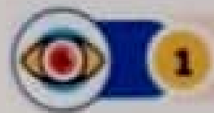


How do the body systems adapt to meet the specific needs of the body?

- The body is made up of systems that work together to perform a job such as digestive system, respiratory system, nervous system.

Definition

- **System:** A group of organs that work together to perform a job to keep an organism alive.

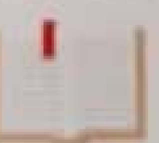


1 Human digestive system:

Why do we need food?

- It provides our bodies with "vitamins and minerals" we need to grow and stay health
- It provides us with "energy" to perform different activities like heart beat and breath.

The body system that is responsible for digestion of food we eat is the "Digestive syste



Definition

Digestion:

- It is the process of breaking down of food into its simplest form to provide the body with nutrients.



Function of the digestive system:

- It breaks down the food into smaller parts that your body can use.



Parents' Tips:

Help your child observe and explore the organs of the human digestive system, the function of each organ and how do they work together in order to perform their functions as a one system by different methods of adaptations.



2 The structure of the human digestive system:

- The human digestive system consists of group of organs that work together which are:
[Mouth-Throat(pharynx)-Esophagus-Stomach-Small intestine-Large intestine-Anus]

Mouth

Throat (Pharynx)

Esophagus

Liver

Stomach

pancreas

Large intestine

Small intestine

Anus



All characteristics of the organs of the human digestive system are considered examples of structural adaptations.



LEARN



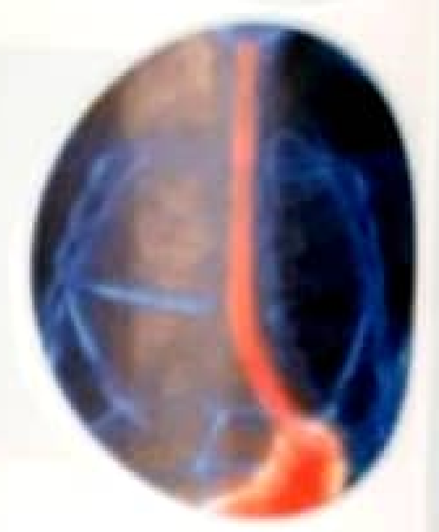
3 Function of the digestive system organs:

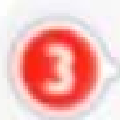


1 Mouth

Includes:

- teeth and tongue: they work together to mix and crush the food until it is soft and mushy.
- Saliva: moistens food and begins to break it down.

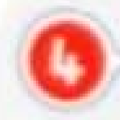




2 Esophagus

- Is a muscular long tube.
- It allows the food to pass from the pharynx to the stomach.





3 Stomach

- Is a muscular sac.
- It mixes the food with acid and digestive juices enzymes.
- The food stays in the stomach for few hours until it is a soupy liquid then it moves to the "small intestine.



4 Small intestine

- is 6 meters long winding tube.
- The liver and pancreatic enzymes are poured in it and they help to break down most of food and convert it into nutrients.
- The walls of the small intestine absorb the produced nutrients through the tiny blood vessels to carry them to all body parts.



5 Large intestine

- It absorbs the water from the undigested food.
- The remaining solid wastes are ejected outside the body through the " anus".



Conclude Like a Scientist

1. Digestion is an important process.

Answer: Because it breaks down food into simple forms, so the body can use it to get energy.

2. Mouth plays an important role in digestion.

Answer: Because mouth breaks up food mechanically by chewing, while teeth and tongue break down the food with the help of saliva.

3. Compare between:

Answer:

Digestion in stomach	Digestion in small intestine	Digestion in large intestine
• It mixes food with acid and digestive enzymes (juices) to change it into liquid.	• The liver and pancreatic enzymes (juices) are poured in it and they help to break down most of food and convert it into nutrients	• The water in unabsorbed food is absorbed in it and no digestion occurs in it.

Some Scientific Facts

- Our heart beats = 100.000 beats/ day.
- We breathe = 20.000 breaths / day.

So, your body needs a lot of energy.

Apply Like a Scientist

(Answer Guide P. 2)

A. Choose the correct answer:

1. The .... is the first organ in the digestive system.
   a. pharynx   b. esophagus   c. mouth   d. stomach
2. The .... allows food to pass from pharynx to stomach.
   a. mouth   b. esophagus   c. small intestine   d. large intestine
3. .... secretes gastric juice.
   a. Stomach   b. Mouth   c. Liver   d. Pancreas
4. The undigested food is stored in the ....
   a. stomach   b. small intestine   c. large intestine   d. pharynx

B. Write the scientific term:

1. A system that breaks down the food into a simple form. (............)
2. The organ that mixes food with saliva. (............)
3. A muscular tube where food passes to the stomach. (............)
4. A juice that is secreted by the stomach. (............)



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10 Body Systems

Activity  **Analyze Like a Scientist**



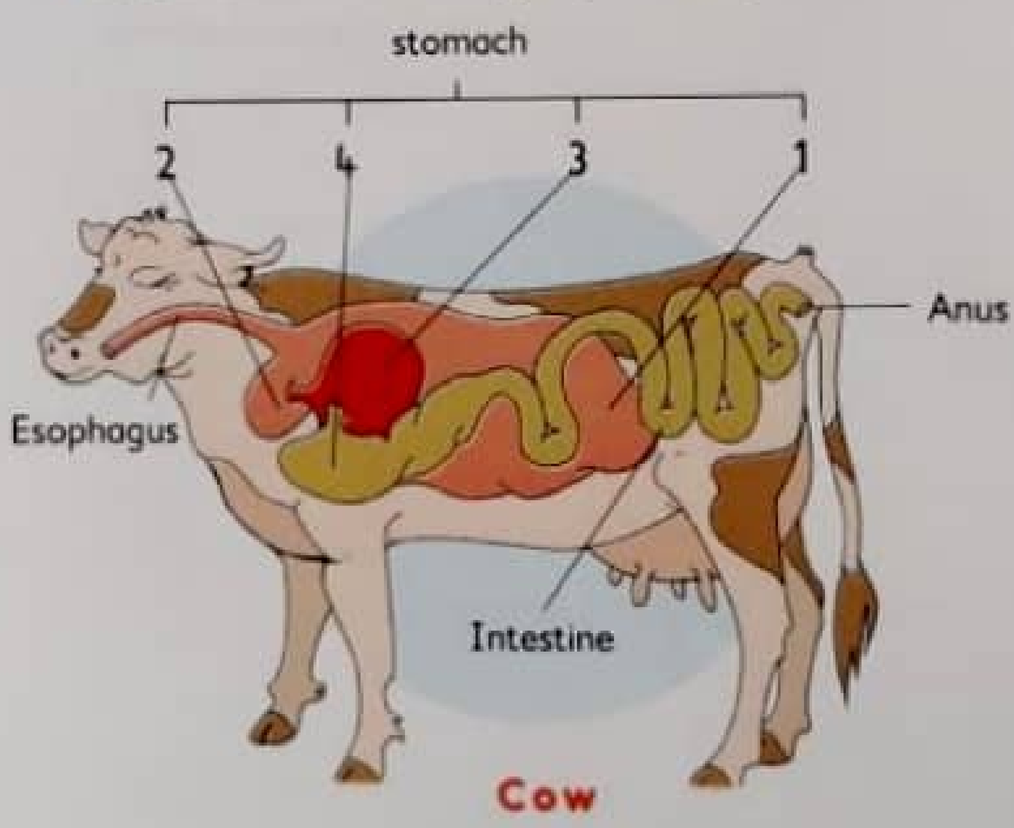
Warm-up

- Most living organisms have the same body systems, but each organism has specific characteristics that help them to survive in their environment

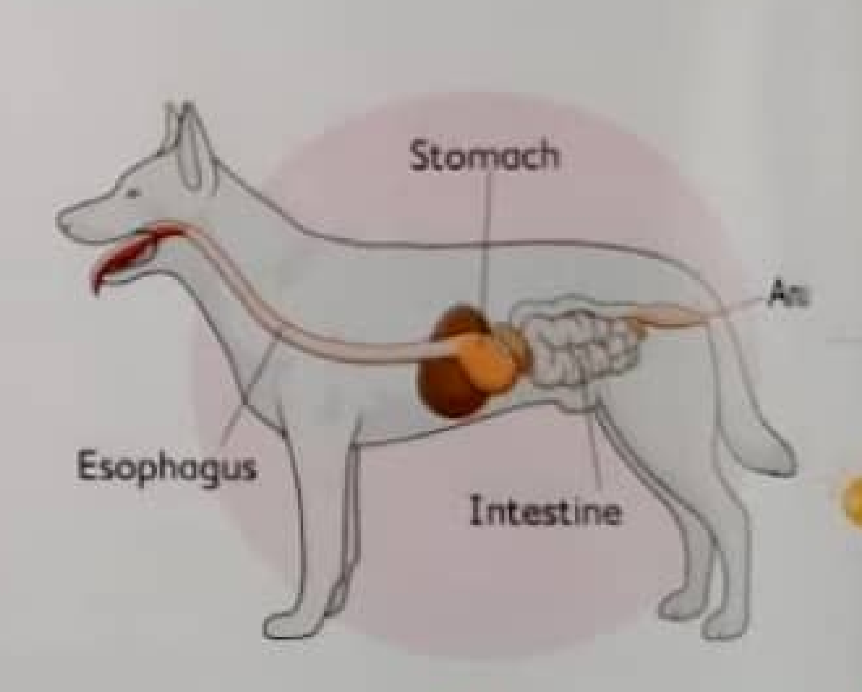


1 Digestive system of different animals:

- Look at the following digestive systems, then answer:



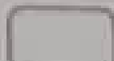
Cow



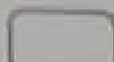
Dog

From your analysis:

- Are all organisms have the same features of their digestive system?

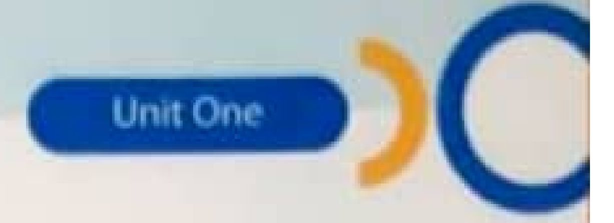
Yes  No ☐

- Do the cow and the dog feed on the same kind of food?

Yes  No ☐

Parents' Tips:

Help your child analyze the function of the digestive system in some animals and how adaptation methods of each organ help the survival of these animals.





2 Comparison between the digestive system of cows and dogs:

- The digestive systems of cows and dogs start at mouth and end at anus like human. In between, special adaptations help each animal process the type of food it eats.

Points of comparison	Cows	Dogs
Feeding nature	• Eat grass which is very difficult to digest.	• Eat mainly meat which is much easier to process.
Digestive system	• Long digestive systems with several stomach-like compartments.	• Only one stomach and a much shorter digestive system.
Teeth	• Flat teeth to eat grass.	• Sharp teeth to tear and eat meat.



Note: All organs and systems of organisms, whether they are animals or plants, are adapted in ways that ensure their survival.

Apply Like a Scientist

(Answer Guide P. 2)

Put (✗) or (✓):

1. Dogs have a long digestive system with many compartments. ( )
2. Cows have sharp teeth to eat grass. ( )
3. Cows have many stomach-like compartments as they eat grass which is hardly digested. ( )
4. The digestive system of a living organism is not adapted to the nature of food that it eats. ( )



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11 Respiratory System

Activity  **Observe Like a Scientist**



Warm-up

- When you breathe in, your chest gets (bigger or smaller).
- When you breathe out, your chest gets (bigger or smaller).

1 Human respiratory system:

Why do we need to breathe?

- The body needs an invisible gas called oxygen which is an important element for the body in order to carry out its functions.
- We get it from the atmospheric air all around us.
- We can't store extra oxygen than our bodies need; so we must breathe in pure and constantly renewed oxygen during a process called "Respiration".



Definition



Respiration "Breathing":

- It the process of inhalation "pulling air in" and exhalation "pushing air out" and the system which is responsible for this process is the Respiratory system.

Parents' Tips:
Help your child observe and explore the organs of the human respiratory system and how do they work together in order to perform their functions as a one system.



- The huma
[Nose - p

Nose

2 Bronc

Alveoli

2 Lungs



2 The structure of the human respiratory system:

- The human respiratory system consists of a group of organs that work together which are:

[Nose - pharynx - Trachea - 2 Bronchi - Lungs].

Nose
Pharynx
Trachea
2 Bronchi
Bronchioles
Alveoli
2 Lungs
Diaphragm



LEARN



3 Function of respiratory system organs:





1 **Nose**

- First organ of the respiratory system where air enters through it.



2 **Pharynx**

- Allows air to pass from the nose to the trachea.



3 **Trachea**

- Allows air to pass to the two lungs and divided into two bronchi at its end.



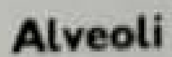
4 **Bronchi**

- Allow air enters the two lungs.
- They are divided into smaller branches when they enter the two lungs and look like tree branches called "Bronchioles" that ends in alveoli.



5 **Lungs**

- The two lungs are responsible for gases exchange as they contain a structure called "Alveoli".



Alveoli

- Tiny air sacs surrounded by blood vessels.
- Oxygen transfers within them to the blood.



6 **Diaphragm**

- A muscle that has an important role in the inhalation process (contracts and moves downward helping the lungs fill with air) and exhalation processes (relaxes and moves upwards pushing air out of lungs).

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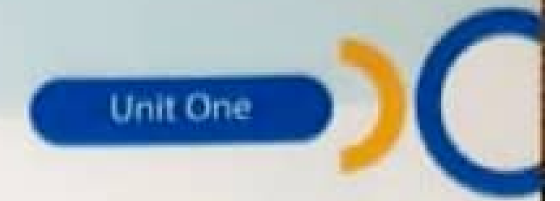
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Mechanism of respiration process:

- Respiration is complex and depends on many organs working together and includes two processes which are inhalation and exhalation processes.

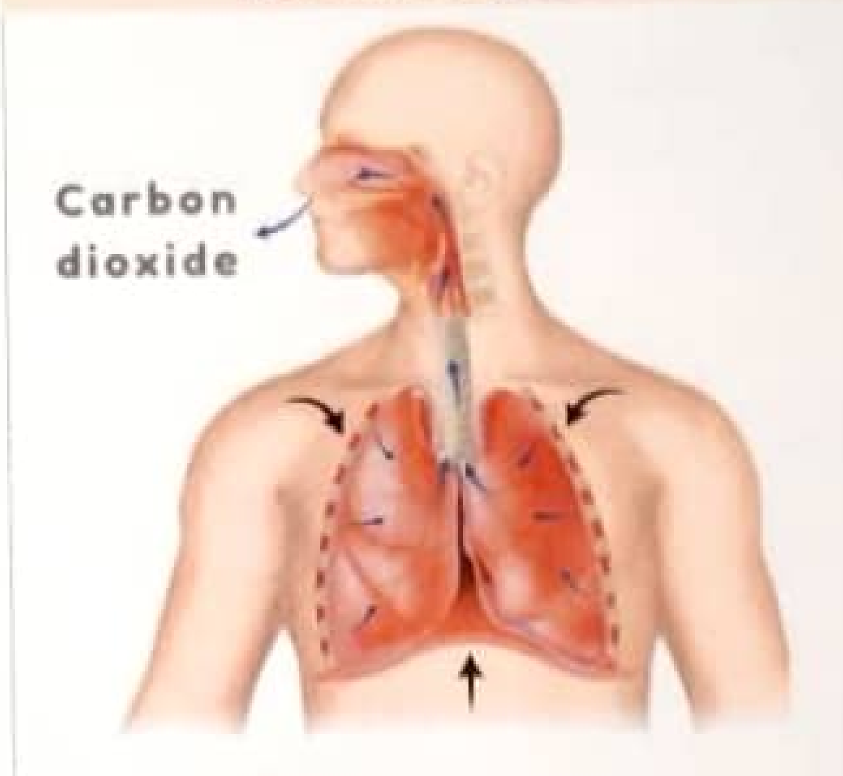
Inhalation process



During inhalation

- Diaphragm moves downwards and shrinks or contracts.
- Air rushes in through nose and mouth rich in oxygen.
- Air passes through the throat to the trachea, then passes through the trachea until it enters the two lungs through the air passages (two bronchi).
- The two lungs enlarge and the air reaches the alveoli which are surrounded by blood vessels.
- In the alveoli, oxygen gas transfers to the blood stream, then distributed to all the body parts.

Exhalation process



During exhalation

- Diaphragm moves upwards and relaxes.
- The two lungs are reduced and the air passes from the alveoli to the two bronchi, then to the trachea.
- Air is forced out through nose and mouth rich in carbon dioxide.

Carbon dioxide gas

Using oxygen from the air creates a waste product which is Carbon dioxide, that is harmful to our bodies if it builds up in our bodies.



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Conclude Like a Scientist

1. Diaphragm plays an important role in respiration. 

Answer: Because during inhalation it contracts and moves downward helping the lungs fill with air, while during exhalation it relaxes and moves upwards pushing air out of lungs.

2. The inhaled air differs from the exhaled air.

Answer: Because the inhaled air is rich in oxygen, while the exhaled air is rich in carbon dioxide.

3. The respiratory system supplies the body with oxygen.

Answer: Because during inhalation, air rich in oxygen enters the two lungs, then it is distributed to all body parts when it transfers to the blood from the alveoli

4. It is hard to trap our breath for long time.

Answer: Because oxygen will not enter the body and carbon dioxide is not removed from the body. If this happens for too long time, the body will fail to function properly.

Apply Like a Scientist

(Answer Guide P. 2)

A. Complete the following:



1. Human inhales .... gas and exhales out .... gas.
2. The respiratory system consists of ...., ..., ..., ... and ....
3. The diaphragm moves .... during inhalation and moves .... during exhalation.

B. Put (✗) or (✓):

1. Air enters lungs during the inhalation process. ( )
2. Alveoli exist in the trachea. ( )
3. Inhaled air contains a large amount of carbon dioxide. ( )

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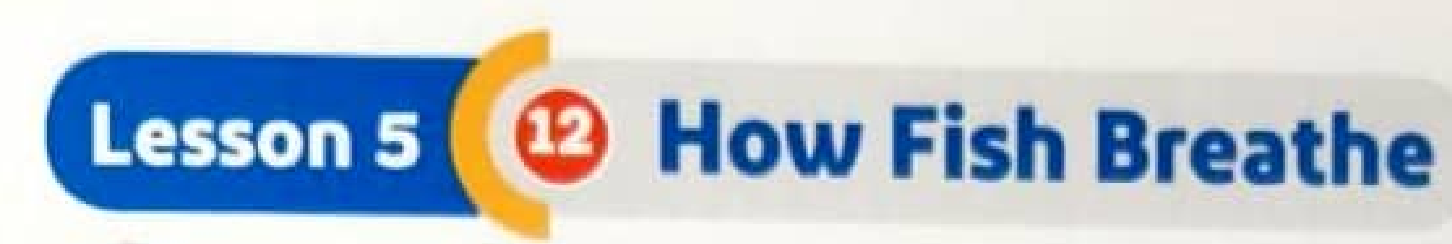
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1 Fish sw its mou across t

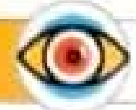
So, fish ne like hu

Parents' Tips:

Help your child obs Compare between t



Lesson 5 (12) How Fish Breathe



Activity Observe Like a Scientist



Warm-up

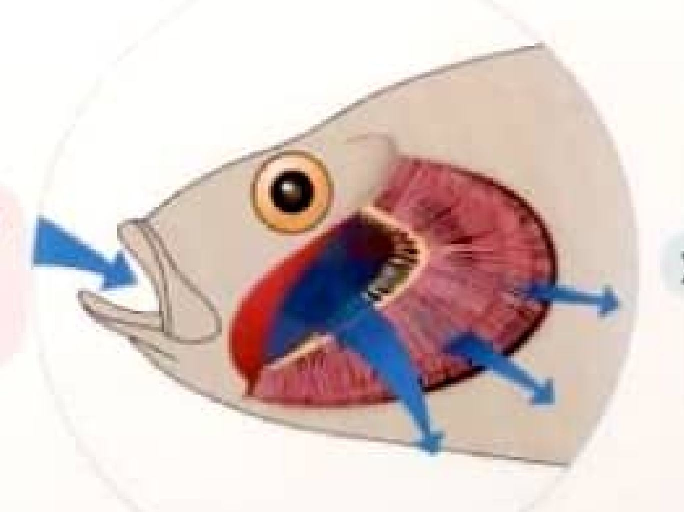
- Have you ever tried to breathe under water?
- Imagine yourself a fish, would your respiratory system look the same?

Structural adaptation of fish:

- Unlike humans, fish don't use lungs to breathe but they have a unique structure called "**Gills**". They are found at both sides of a fish's head and this is called structural adaptation.
- The structural adoptation in fish enables them to inhale dissolved "Oxygen" and exhale "Carbon dioxide" under water.

How do fish breathe?

1 Fish swallows water through its mouth, then water passes across the gills.



2 Blood vessels inside gills take the oxygen out of water, then carry it to the rest of the body and release carbon dioxide.

So, fish need clean air and water that is not polluted in order to survive in its habitat like human beings.

Parents' Tips:

Help your child observe and explore how structural adaptations in the respiratory system of fish help them survive under water. Compare between the adaptation methods in human and fish respiratory systems.



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Conclude Like a Scientist

- List the similarities and differences between respiration in human and fish.



Similarities:

Both take in oxygen, send oxygen through blood and body and release carbon dioxide.

Differences:

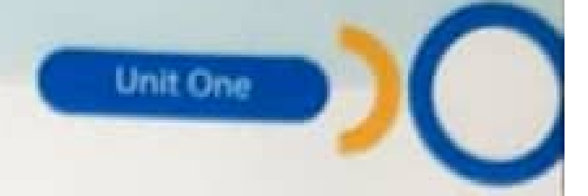
Humans have lungs and take in oxygen from air. Fish have gills and take in oxygen from water.

Apply Like a Scientist

(Answer Guide P. 2)

Complete the following:

1. The type of adaptation in fish gills is .... adaptation that allows fish breathe underwater.
2. During respiration in humans and fish, the gases exchange is the same as they both inhale .... and exhale ....
3. The difference between the respiratory system of human and fish is ....





13 Humans Change the Environment

Activity  **Analyze Like a Scientist**



Warm-up

- Do the human activities harm the environment? Yes ☐ No ☐
- Human activities often cause impacts in the ecosystem over time, so organisms will have to adapt to these changes in order to survive.



1 Environmental changes are classified as:

Slow changes	Fast changes
Lead to: ▸ In this case the organisms will be able to adapt over time in order to survive.	**Lead to:** ▸ Some organisms move from one habitat to another where they can live and survive. ▸ The disappearance and the death of some living organisms. ▸ The extinction of some living organisms

2 Types of environmental changes:





1 Natural changes

- **Occur naturally as they are a part from the ecosystem and may change the nature of the plants we depend on in food, resulting in the increase or decrease in numbers of predators and prey such as:**

1- Changes of temperature.
2- Changes in the amount of rains during year season
3- Extreme climatic conditions
4- Floods
5- Wildfires





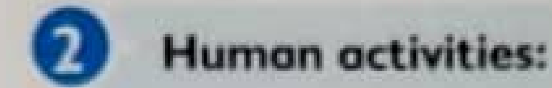


Parents' Tips:

Help your child identify the human effects that change the environment and analyze the relation between these effect and the adaptation of plants and animals overtime in order to survive.



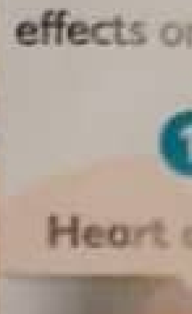
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2 Human activities:











- **Human activities that cause changes to the environment such as:**

1- Cutting down trees
2- Farming and clearing lands
3- Building urban communities instead of green areas.
4- Introducing plants, and animals into the environment which were never part of it.
5- Air pollution due to the exhaust of cars and factories operating improperly.
6- Water pollution due to littering or dumping materials into the soil and waterways.

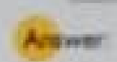
Conclude Like a Scientist:

1. Wildfires and floods affect the environment: 



Because they alter the plants available for food, causing the increase or decrease in **predators** and preys populations.

2. Man interference, such as introducing new animals and plants that where never part of the environment, has a bad effect on it. 



Because these types of changes can cause the disappearance of plants and animals that once lived in an environment.

3. Although the air, water, or soil in an area are no longer safe, plants and animals can survive. G.R.



Because:

- Some animals can survive by moving to another ecosystem to find what they need.
- Plants rely on their seeds landing in a better place for them to survive and grow.





3 Negative effects of human activities on human:

- As the human activities have negative effects on animals and plants, they also have negative effects on human such as:

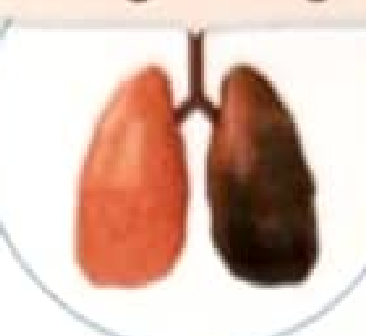
1. Heart diseases



2. Asthma disease



3. Lungs damage



4. Breathing difficulty



So,
- If the crops do not grow, and it is hard to find clean water, we can't live and breathe due to smoke.
- Some people try to solve this by changing their behaviors, life style or moving to less polluted areas.

As man causes harmful changes in the environment, he is also able to restore the ecosystem by:

1- Replanting cleared forests.

2- Removing air and water pollutants.

3- Preserving native animals and plants.



(Answer Guide P. 2)



Complete the following sentences: - (using the given words)

human activities -pollutants – positive -negative - natural

1- The air pollution is one of the .... effects on the respiratory system.

2- Increasing the green area is one of the .... effects on the respiratory system.

3- The human can restore the ecosystem to its nature by removing air and water ....

4. Flood is one of the .... changes, while cutting trees is one of the .... that have negative effects.

Al-Adwaa Exercises on Learn Activities

(Answer Guide: P. 3)

1 Choose the correct answer:

1. .... system is responsible for breaking down the food.
   a. Respiratory   b. Digestive   c. Urinary
2. Cactus has spines to ....
   a. reduce loss of water   b. absorb sunlight   c. to lose water
3. Fish breathe through ....
   a. lungs   b. gills   c. skin
4. Cows have .... stomach compartments.
   a. 1   b. 2   c. 4
5. Palm legs of ducks and geese that enable them swim in lakes is a .... adaptation.
   a. behavioral   b. structural   c. No correct answer
6. The hump of the camel stores fat to ....
   a. provide it with energy   b. protect it from hot weather
   c. to lose water easily
7. Darker leaves help absorb energy from Sun is a .... adaptation.
   a. structural   b. behavioral   c. No correct answer
8. Desert plants adapt for hot climate by having ....
   a. waxy covering   b. toxins   c. climbing stem

2 Put (✓) or (X) for each of the following:

1. There is 1 type of adaptation. (
2. Wide leaves of water lily is a behavioral adaptation. (
3. All living organisms have the same characteristics of the digestive system. (
4. Bull shark's countershading phenomenon is a structural adaptation. (
5. Cutting down trees and eroding soils are from the environmental changes happening due to human activities. (





6. Short leg
7. Migration
is a metho
8. Animals t
layers unc

3 Complet

(negative - sma

1.
2. Stomach s
3.
during exh
4.
5. The tall le
6. The air pol
7. Increasing
system.

4 Write the

1. The change
and survive
2. The body s
3. Air sacs fou

5 Write two

a.

6 List one ex

1. In plants:
a. Structural
2. In animals:
a. Structural
3. In humans:
a. Structural

6. Short legs of arctic fox help it keep its body warm. ( )
7. Migration of salmon fish to warmer oceanic water in order to reproduce is a method of structural adaptation. ( )
8. Animals that live in polar habitats have dense fur or feathers and fatty layers under their skin. ( )

3 Complete using the given words:

(negative - small intestine - structural - gastric juice - water pollution- diaphragm- positive)

1. .... is from the negative effects of human activities.
2. Stomach secretes .... to mix food with liquids.
3. .... is a muscle that moves downwards during inhalation and upwards during exhalation.
4. .... is a 6-meters-long coiled tube.
5. The tall length of Acacia tree is a .... adaptation.
6. The air pollution is one of the .... effects on the respiratory system.
7. Increasing the green area is one of the .... effects on the respiratory system.

4 Write the scientific term for the following:

1. The change in the organism's behavior to adapt to its habitat and survive. (....................)
2. The body system responsible for breathing in and breathing out. (....................)
3. Air sacs found in the two lungs where gases exchange occurs. (....................)

5 Write two things a habitat must provide for an animal or plant?

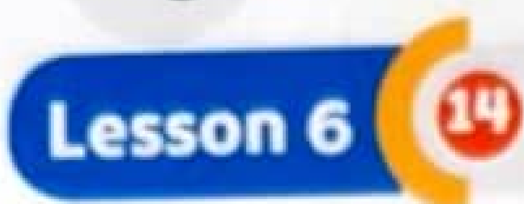
a. .... b. ....

6 List one example for a structural and behavioral adaptation for each:

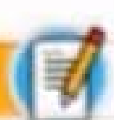
1. In plants:
   a. Structurals .... b. Behavioral: ....
2. In animals:
   a. Structural .... b. Behavioral ....
3. In humans:
   a. Structural .... b. Behavioral ....

SHARE





Lesson 6 (14) Record Evidence: Penguin



Activity Record Evidence Like a Scientist



Definition

Adaptation:

- It is a change in the characteristics of living organism that help it survive.

- **Types of adaptation:**

Structural Adaptation	Behavioral Adaptation
• It is the change in the organism body to adapt with its habitat and survive.	• It is the change in the organism's behavior to adapt with its habitat and survive.

- **Types and methods of adaptations in some living organisms:**

Living organism	Type of adaptation	Method of adaptation	Reason
• Fennec fox	• Behavioral	• Panting	• To lower its body temperature
• Polar bear	• Structural	• White thick fur	• To stay warm in cold places.
• panther chameleon	• Structural	• Its eyes look at different directions at the same time.	• To avoid danger.
• Acacia Tree	• Behavioral	• Send warn signal.	• To emit poisonous materials in its leaves to keep plant eaters away

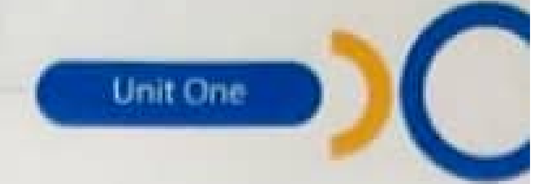
Definition

Camouflage:

- It is a type of behavioral adaptation that helps animals hide from predators or attack their prey.

Parents' Tips:

Help your child revise what he/she learned throughout the concept about the adaptation types and methods in living organisms for their survival. Write an explanation with evidence why penguins feet don`t freeze.



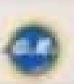
- Now, act like a scientist by following the scientific method to review an idea:

How do different types of animals and plants adapt to survive extreme climates?

Claim:

Different types of animals and plants adapt to extreme climates in order to survive.

Evidence:

Penguin's feet don't freeze in the extreme climatic conditions of its polar habitat. 

Scientific Explanation

- Blood vessels carrying warm blood from the warm parts of the penguin's body weave around the blood vessels carrying blood from the cold feet. This warms the blood vessels that need it.

Definition

Digestion:

- It is the process of breaking down food into simple form to get benefit from its nutrients.
- Organs of the digestive system:
  Mouth - Pharynx - Esophagus - Stomach - Liver - Pancreas - Small Intestine - Large Intestine - Anus
- The structural adaptations in the digestive system of the living organism depends on the nature of the food they eat, as some animals eat meat and others eat grass.

Definition

Respiration:

- It is the process of breathing in oxygen and breathing out carbon dioxide, and includes two process which are inhalation and exhalation.
- Organs of the respiratory system:
  Nose - Pharynx - Trachea - Bronchi - Lungs
- The structural adaptation in the respiratory system of fish that enables it to breathe oxygen under water as they respire by gills to extract the dissolved oxygen in water.
- The negative effects of the man interference in the environment also affect him causing:
  - Heart diseases
  - Asthma disease, lungs damage and difficulty in breathing
- Man can return the balance to the environment by:
  1. replanting cleared forests.
  2. removing air and water pollutants.
  3. preserving native animals and plants.



SHARE



15 STEM In Action

Career And Adaptation

Activity  Analyze Like a Scientist



The relation between adaptation and survival:

Amphibians:

- They are animals that live on land and in water "wetland habitats" such as the Egyptian frog and the Golden frog.
- **Amphibians have structural adaptations that enables them respire in their habitat in order to survive:**

Respire through lungs	Respire through skin
• It inhales oxygen from the air through the lungs and ejects out carbon dioxide.	• Its body is covered by skin that allows water and gas to pass through it, as the skin extracts oxygen directly from water.

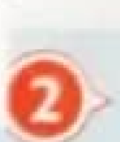


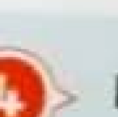
So, this remarkable adaptation makes amphibians well-suited to wet environments.

- These animals need clean water in order to survive healthy, as they are very sensitive to the effects of air, water pollutions and viruses transferred by water that cause:
  - About 90 species of amphibians have been extinct in 20 years, such as the golden frog.
  - In addition to the dramatic decline of 124 other species.
- The role of scientists in the amphibian rescue and protection project:
  - Scientists can learn the ways organisms adapt to their environments and how these animals interact with the environment and what in their surroundings is making them sick through research, then we can use this knowledge to help the survival of endangered species.

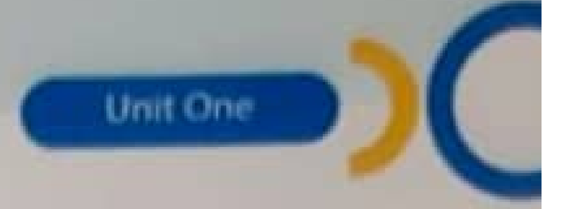
Parents' Tips:

Help your child summarize what he/she have learned about.







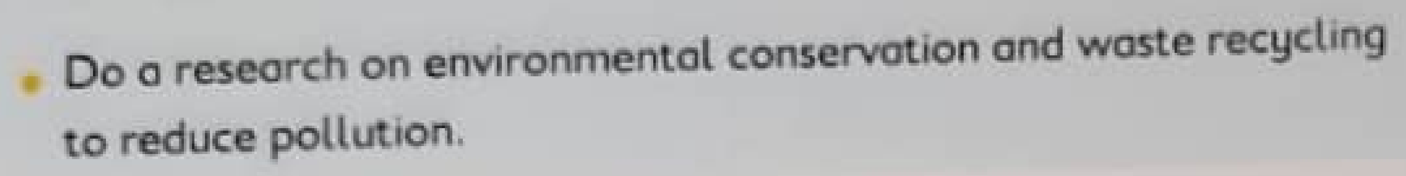




- After you have learnt the methods of adaptation, effect of natural changes and man interference in the environment and other living organisms.
- How to prevent the extinction of endangered species.




1 Science



- Do a research on environmental conservation and waste recycling to reduce pollution.



2 Technology

- Development of water treatment plants to reduce water pollution and reuse it in different fields.



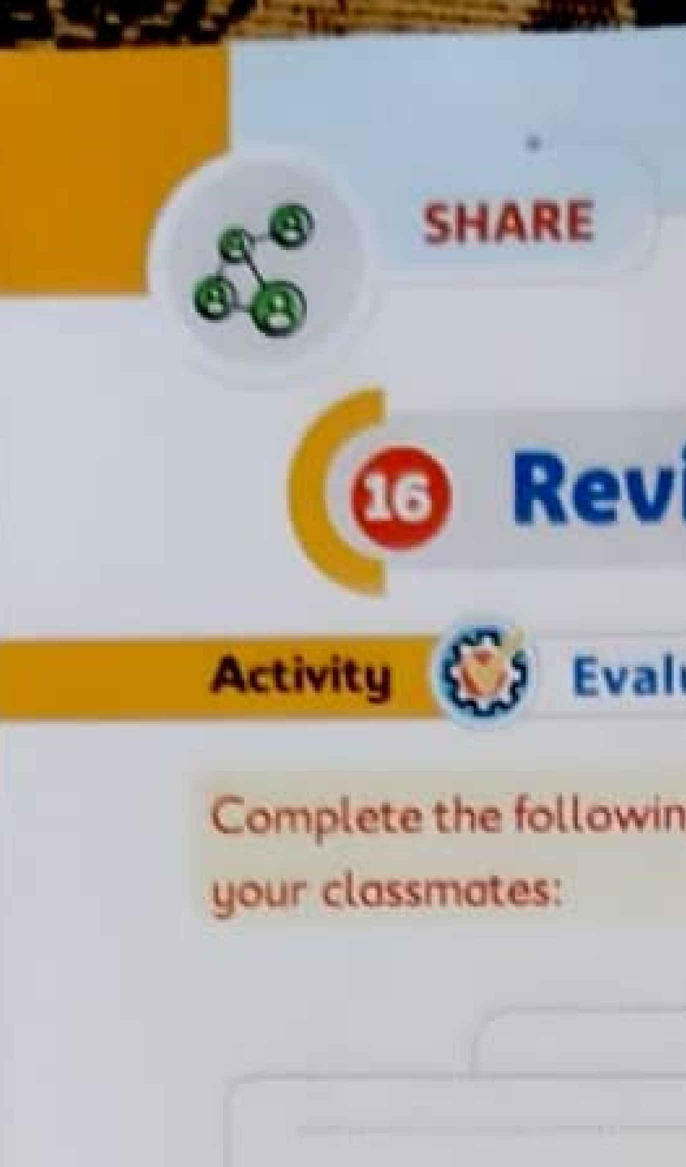
3 Engineering

- Design a piece of land that could serve as a model for a nature reserve to preserve endangered organisms.



4 Mathematics

- Make a graph showing the relationship between the number of a particular species of organism that is endangered (from 1950 to 2020).



16 Review: Adaptation and Survival

Activity — Evaluate Like a Scientist

Complete the following infographes to make a concept summary, then share it with your classmates:

Types of adaptation

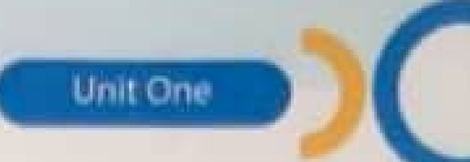
....	....

- Methods of adaptation in plants:

Organ	Method of adaptation	Reason
Leaves		
Trunk "Stem"		
Roots		

- Methods of adaptation in animals:

Method of adaptation	Reason



• Write the function of each organ:

A. Organs of the digestive system

- Mouth ______________________
- Pharynx ______________________
- Esophagus ______________________
- Stomach ______________________
- Small intestine ______________________
- Large intestine ______________________

B. Organs of the respiratory system

- Nose ______________________
- Pharynx ______________________
- Trachea ______________________
- Bronchi ______________________
- Lungs ______________________
- Diaphragm ______________________

Types of environmental Changes	
....	....
Ex • .... • .... • .... •	Ex • .... • .... • .... • ....

Al-Adwaa

Exercises on Concept 1

(Answer Guide: P. 3)

1 Choose the correct answer:

1. Organisms that do not have the methods that help them adapt to the environme changes ....
   a. increase
   b. extinct
   c. stay the same
   d. the biodiversity of the ecosystem has increa

2. The black and brown fur of bears in tropical habitat help them ....
   a. hide between trees
   b. do camouflage
   c. hunt animals in their habitat
   d. All of the previous

3. Aquatic plants like lotus have .... leaves to capture as much as possible sunlight.
   a. flat
   b. curly
   c. spine
   d. No correct answe

4. The structural adaptation of pine trees which enables them to let the snow slide is ......
   a. umbrella-shaped canopy
   b. flat leaves
   c. triangular branches
   d. All of the previous

5. All the following are from the structural adaptations of the panther chameleon exc ....
   a. V-shaped feet
   b. coil-like tails
   c. independent eye sight for each one
   d. changes its scales color when it feels dang

6. From the methods of structural adaptation(s) of desert plants to survive in the extr climatic conditions is ....
   a. branched roots
   b. deep roots
   c. store water in their stem
   d. All of the previous

7. Mangrove trees have strong, long roots in order to ....
   a. withstand in front of strong waves
   b. absorb shallow water
   c. absorb underground water
   d. All of the previous

8. .... is/are from the digestive enzymes that help(s) in the digestion process.
   a. Bile and pancreatic juices
   b. Saliva
   c. Gastric juice
   d. All of the previous

9. The remaining soil wastes are ejected out of the body through ....
   a. large intestine
   b. stomach
   c. esophagus
   d. anus

10. The gases exchange occurs within the ....
    a. alveoli
    b. bronchi
    c. trachea
    d. No correct answ

11. The oxygen path in the respiratory system is ....
    a. nose, pharynx, trachea, bronchi, alveoli
    b. alveoli, pharynx, trachea, bronchi, no
    c. alveoli, bronchi, trachea, pharynx, nose
    d. No correct answer

12. Carbon dioxide gas is ejected out the body through ....
   a. inhalation   b. exhalation   c. digestion   d. reproduction

13. All of the following are examples of man's interference that causes the environmental pollution except ....
   a. eroding the soil   b. smokes of cars and factories
   c. cutting down trees   d. floods

14. Adaptation methods affect the survival rate of species as ....
   a. adaptation methods reduce the survival rate of specie
   b. adaptation methods increase the survival rate of species
   c. methods of adaptation change the compositional manifestations of the organism
   d. the methods of adaptation change all the behaviors acquired by the living organism

2 Complete the following sentences:

1. Adaptation in living organisms is classified into .... and ....
2. The heat transfers from vessels that carry .... blood under the skin to the vessels that carry .... blood, in order to keep the feet of arctic animals warm.
3. Fennec fox has long ears to .... its body temperature and strengthen .... sense, while arctic fox has .... legs and .... to keep its body warm.
4. Countershading phenomenon of bull shark is a method of .... adaptation.
5. The digestive system starts with .... and ends with ....
6. The small intestine is about .... meters long.
7. During inhalation, the air is rich in .... which transfers to all body cells by the ....
8. The two bronchi are divided into .... within the lungs.
9. The alveoli are surrounded by ....

3 Put (✓) or (✗):

1. Camouflage is a method of self-defense as it is a behavioral adaptation only. (   )
2. Camel's hump that stores fats in order to survive in extreme climatic conditions is a method of structural adaptation. (   )
3. Behavioral adaptation is always related to a modification of the body organs. (   )
4. Transferring of fluffy seeds easily by wind is a structural adaptation for desert trees. (   )
5. Plant's leaves in extremely hot climatic conditions are small and spiked in order to increase the water loss. (   )
6. Meat-eater animals like dogs and lions have only one chamber stomach and long digestive system. (   )
7. During exhalation the diaphragm moves upwards and relaxes. (   )
8. Carbon dioxide is important for respiration of living organisms. (   )

4 Write scientific term:

1. Roots that grows along the sides of the tree trunks to support it in the soggy soil of the tropical habitats. (..........)
2. A muscle that has an important role in the respiration process. (..........)
3. The process which is responsible for oxygen intake. (..........)
4. An organ which is responsible for the absorption of the nutritional elements from the digested food. (..........)
5. An organ that allows food to pass from the mouth to the stomach. (..........)
6. The first organ of the respiratory system. (..........)

5 What happens if/when...?

1. Panting animals like fennec fox and dogs breathe faster than 700 breaths per minute
   ....
2. A predator attacks the panther chameleon.
   ....
3. Environmental changes affect the habitats of some living organisms.
   ....
4. The diaphragm moves upwards.
   ....
5. Someone doesn't breathe for a long period.
   ....

6 Give reason for each of the following

1. Artic animals' feet such as penguins which are not covered with feathers do not free
   ....
2. Trees in the tropical habitats have tall trunks and umbrella-shaped canopy.
   ....
3. Plants such as Acacia tree pumps poisonous materials within their body parts.
   ....
4. Air pollution made by human has bad effect on his health.
   ....

7 Mention the importance of....

1. Deep branched roots of desert plants: ....
2. Thorns along the branches in Acacia tree: ....
3. Flat and large leaves of tropical plants: ....
4. Esophagus: ....

5. Large intestine: ....

6. Gills of fish: ....

7. Alveoli: ....

8 Look at the following figures, then answer the following questions:

A) - This figure represents the .... system.

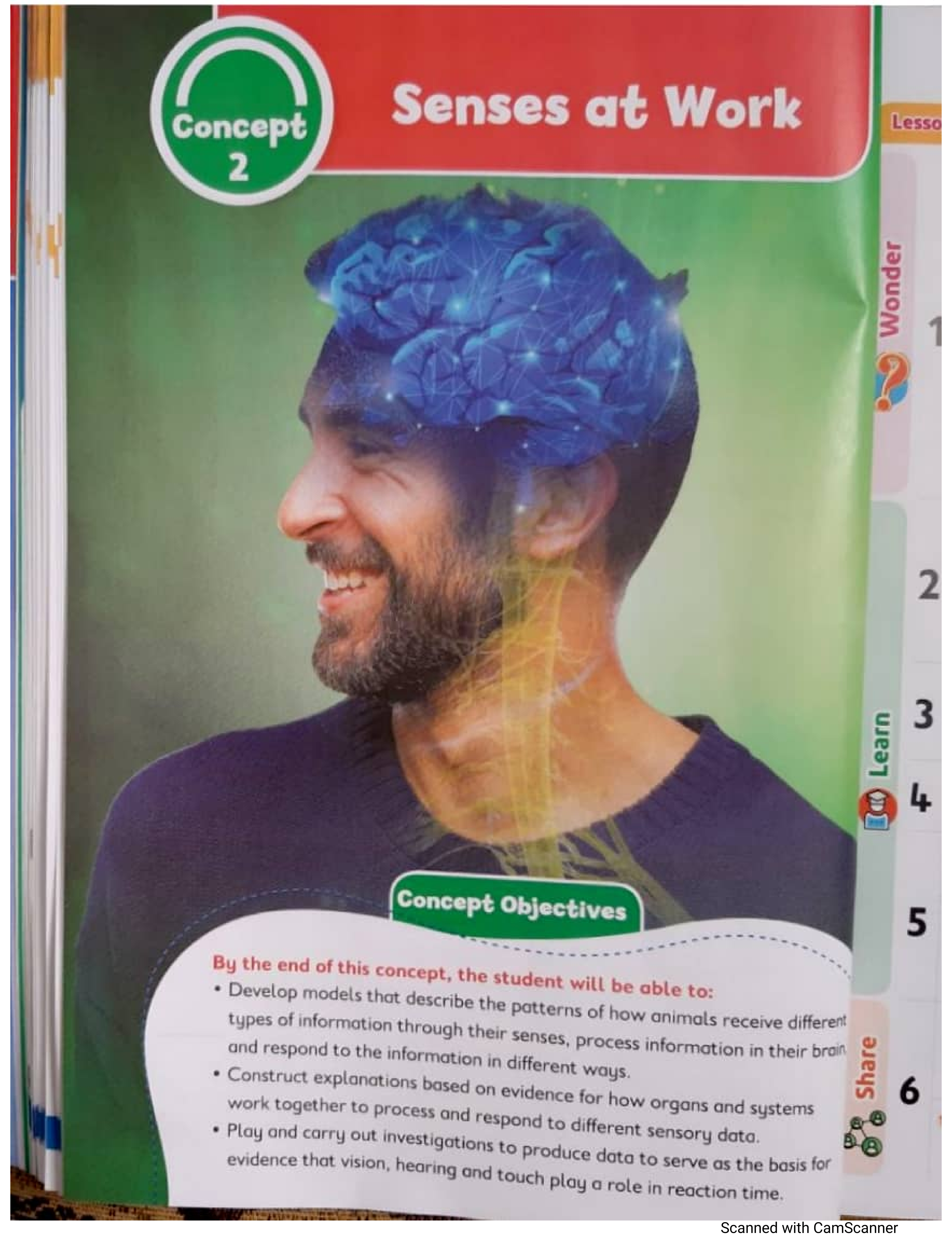
1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....

B) - This system is responsible for .... ,
and it is called .... system.

1. ....
2. ....
3. ....
4. ....
5. ....
6. ....
7. ....
8. ....

9 Classify each of the following into structural or behavioral adaptation:

1. Bull shark's body is adapted to live in salt or fresh water. (........................)
2. Panther chameleon changes the color of its scales when it is in danger. (........................)
3. The presence of buttress roots that grow higher in some plants. (........................)
4. Sending warn signals to other plants via the wind during danger. (........................)
5. Penguin's wings are modified into fins to help it swim in the water. (........................)
6. Quail migration to warmer places in order to reproduce. (........................)
7. Spine-like leaves of some plants like pine tree. (........................)
8. Feeding flexibility of some animals due to the environmental changes in their habitats. (........................)
9. Long fingers of monkey's feet to catch the tree branches. (........................)
10. Aestivation of some frogs, reptiles like agama lizard and crocodiles in order to escape high temperatures, water and food shortage during summer. (........................)



Concept 2

Senses at Work

Concept Objectives

By the end of this concept, the student will be able to:

- Develop models that describe the patterns of how animals receive different types of information through their senses, process information in their brain and respond to the information in different ways.
- Construct explanations based on evidence for how organs and systems work together to process and respond to different sensory data.
- Play and carry out investigations to produce data to serve as the basis for evidence that vision, hearing and touch play a role in reaction time.

"Pacing Guide"

Lesson	Activity	Key Terms	Life Skills
Wonder 1	**1 Can You Explain?** • Students use prior knowledge to begin their explanation of how animals use their senses to collect information and process it to help them survive.	Egyptian mongoose	Students can share ideas (Endurance)
	2 Dolphin Super Senses • Students ask questions that can be investigated about sensory organs and the nervous system.	Echolocation	Students ask questions to clarify (Negotiation)
	3 Using Our Five Senses • Students explore patterns of how the five senses are used to gather and process information in an environment.	The Five Senses Senses Organs	______
	4 What Do You Already Know About Senses at Work? • Students use existing knowledge of animals' senses and perception to demonstrate their understanding of how animals' senses help them survive.	Sensory responses Nerves Brain	______
Learn 2	**5 Super Senses** • Students find evidence to explain how the unique sensory abilities of some animals help them to hunt for food when the animals cannot rely on the sense of sight alone.	Nocturnal animals	Students can identify problems (Critical Thinking)
	6 Pizza and the Nervous System • Students explore how the senses work together with the nervous system to gather information in an environment.	Brain Spinal Cord Nerves	______
3	**8 Sensing the Environment** • Students look for evidence to explain how physical adaptations specialized sensory systems and the nervous system work together to help the jerboa survive.	Sensory receptors	Critical Thinking
4	**10 Hands-On Investigation: Reaction Time** • Students carry out an investigation about reaction time in response to auditory versus visual stimuli.	Reaction Time	Students can think about how many teams work together (collaboration)
	11 How the Nervous System Work • Students engage in argument from evidence to decide how parts of the nervous system are connected.	Reflexes Process information	______
5	**12 Describing the Nervous System** • Students explain how components of the nervous system work together to carry out functions that the individual part cannot do alone.	Nervous system	Students use information to solve a problem (Problem Solving)
Share 6	**14 Record Evidence: Dolphin Super Sense** • Students construct explanations to communicate information about how animals use their nervous system to retrieve and respond to information in the environment.	______	______
	16 Review: Senses at Work		The student can



WONDER



Lesson 1 ① Can You Explain?



Warm-up

- Do animals use their senses to adapt and survive in their environment?

Yes ☐ No ☐

The Egyptian Mongoose

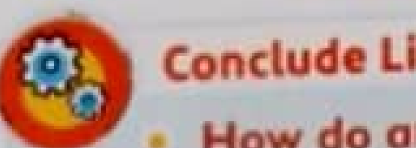
How do the Egyptian mongooses communicate with each other?

- When they move from one place to another or search for food:

① They combine units of sound which seem to us like a chatter.



② Other mongoose animals receive these sound messages using their hearing sense and begin to foraging (collect food) and move.



Conclude Like a Scientist

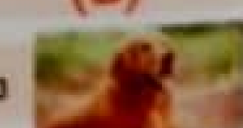
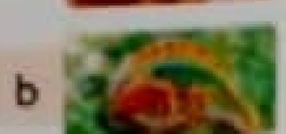
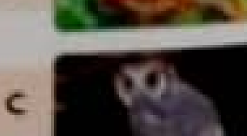
- **How do animals sense and process information?**

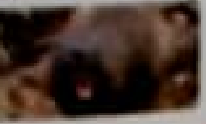
Answer
- Some animals have better hearing, sight or other senses than humans.
- Animals communicate with each other using sound or movement.

Apply Like a Scientist

(Answer Guide: P. 4)

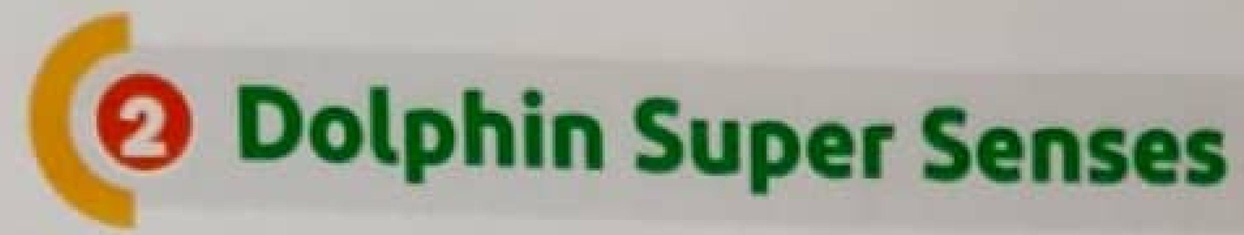
Choose from column (B) what suits in column (A):

(A)		(B)
1	Has a strong smell sense.	a 
2	Has a strong night vision.	b 
3	Its eyes look in opposite directions at the same time.	c 
4	Has a strong sense of hearing chatter.	d 

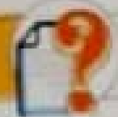


Parents' Tips:

Help your child use his/her prior knowledge by asking him/her to explain how animals sense and process information.



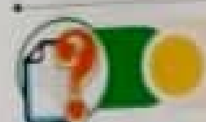
2 Dolphin Super Senses

Activity  **Ask Questions Like a Scientist**



Warm-up

- Do some animals have super senses? Yes  No 



The super abilities of the sensory organs of the dolphin.



Dolphin uses its super hearing sense to be able to:

Find food.	Protect itself in dark murky water.

Conclude Like a Scientist

- **How do dolphins use their super senses to survive?**

Answer

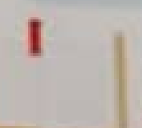
Dolphin uses the sense of echolocation, which helps it locate objects under water surface.



3 The echoes help dolphin locate its prey and other objects.

1 Dolphin produces sound waves that are transmitted through water.

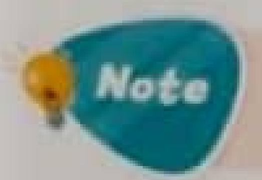
2 When sound waves hit objects, they bounce back to the dolphin in a form of echoes.



Definition

Echolocation:

- It is a way that some animals such as whales, bats and dolphins use to determine the location of prey and objects by hearing the echoes of the produced sounds.



Note Dolphins have good sight.

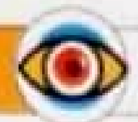
Parents' Tips:

Help your child think about the role of animals' senses and ask about the super senses of animals that help them to survive.





3 Using Our Five Senses



Activity: Observe Like a Scientist



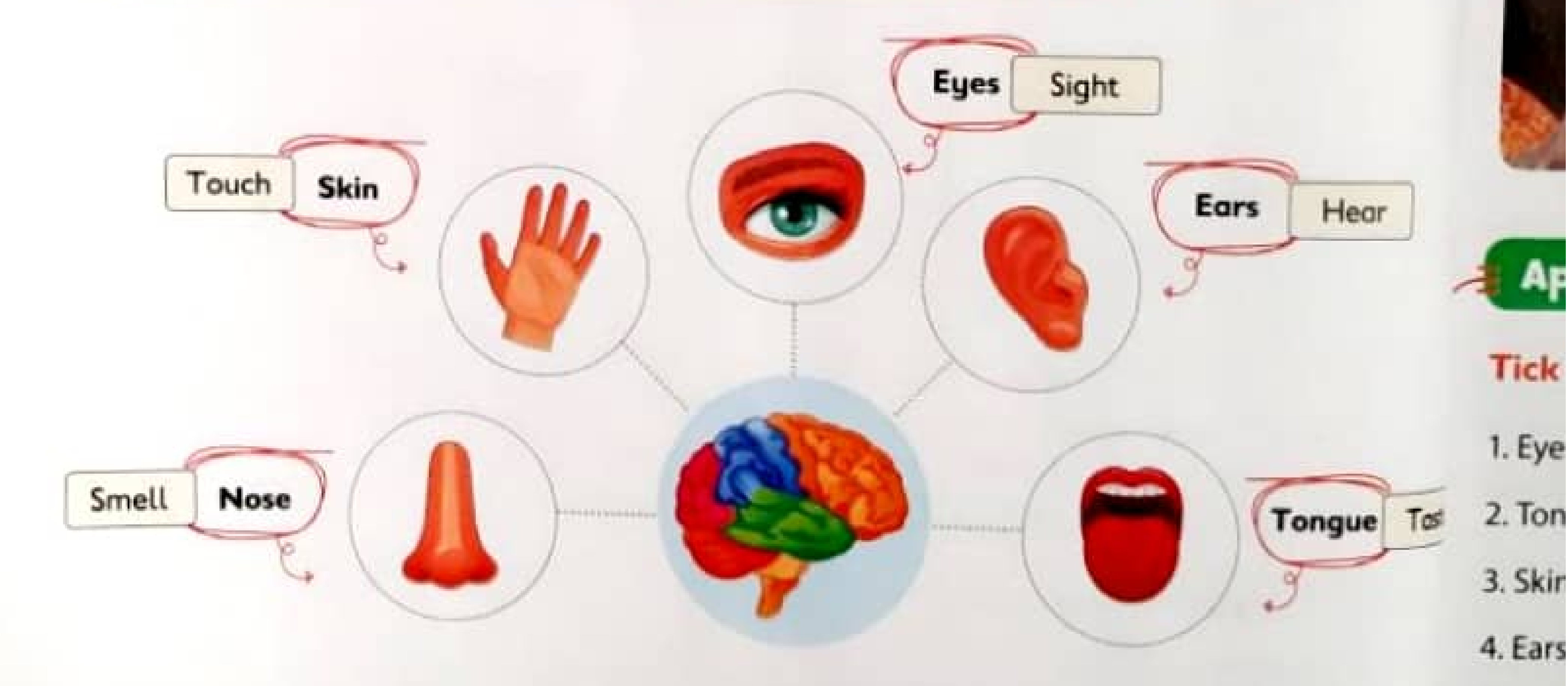
Warm-up

- Each sense organ is responsible for receiving a special type of information from the environment to enable the living organism to live, survive and communicate.



The five senses

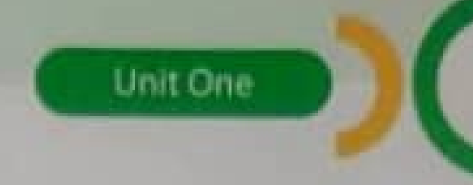
Humans have five basic senses and sense organs associated with each sense sen[d] information to the brain to help us understand the world around us.



We can use more than one sense at the same time.

Parents' Tips:

Help your child observe how he/she uses his/her senses to understand the world around him/her.



om the

nse send

ear

ue Taste

Animals differ from humans in the use of their senses.

1. Owls have super hearing and sight senses help it to find food.



2. The sight sense of eagles helps them to see from long heights.



3. Snakes feel the body warmth of its prey from a long distance at night.



4. Bats use the echolocation sense to determine the prey's location.



Apply Like a Scientist

(Answer Guide: P.4)



Tick (✓) the correct sentence(s):

1. Eyes help us see different colors.
2. Tongue helps us hear sounds.
3. Skin helps us feel the hot objects.
4. Ears help us hear sounds.
5. Tongue helps us taste food.
6. Animals' sense organs work as humans' sense organs.



4 What Do You Already know About Senses at Work?



Activity Evaluate Like a Scientist



Warm-up

- Can animals use more than one sense for the same purpose? Yes ☐ No ☐

1 The animal can use more than one sense to perform a certain purpose to help survive in its habitat.

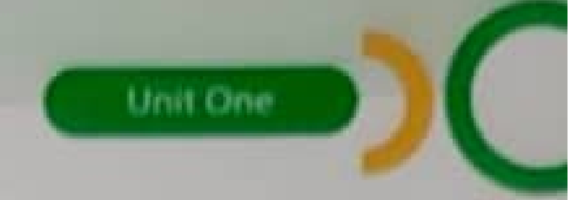
- The following examples represent how animals use their senses for different purposes.

Panther chameleon	Fox	Dog
		
Used senses: sight - smelling - tasting The purpose: • Get food. • Avoid dangers.	Used senses: smelling - sight The purpose: • Find food.	Used senses: smelling - sight - hearing The purpose: • Recognize friends. • Get food.



Parents' Tips:

Help your child demonstrate his/her existing knowledge about animals' senses.





2 Sensory Response

- When you touch an ice cube with your index finger (external information).
- The external information transfers by nerves from hand to brain in which information processing occurs and tells you it is cold.



So, brain is the organ that processes information.



Apply Like a Scientist

(Answer Guide: P. 4)

1. Complete the following table:

The used senses	The purpose	Example
....	Identify objects	Dolphin
....	Distinguishing spoiled food	Human
....	Hunting	Tiger



2. Choose the correct answer:

- When you touch a plant with sharp thorns, ... makes you feel pain.

(brain – lung – stomach)

Al-Adwaa Exercises on Wonder Activities

(Answer Guide: P. 4)

(A) Complete the following sentences using the given words below:

(behavioral - eye - communicate - echolocation - Brain - structural - sight)

1. Dolphins use ______ to locate their food.
2. Egyptian mongooses make chatters to ______ with each other.
3. The sense organ which is responsible for sight is ______.
4. Super smell sense of a dog's nose is a kind of ______ adaptation.
5. ______ is the organ that helps us respond to external information.
6. Panther chameleon uses ______ sense to avoid danger and get food same time.

(B) Choose the correct answer:

1. All of the following are from the benefits of echolocation except
   a. searching for food
   b. communicating with each other
   c. protecting dolphin underwater in the dark to survive
   d. being devoured easily
2. ______ receive external information.
   a. Senses
   b. Mails
   c. Sense organs
   d. No correct answer
3. ______ uses the sense of hearing to get food.
   a. Panther chameleon
   b. Bat
   c. Dog
   d. No correct answer.

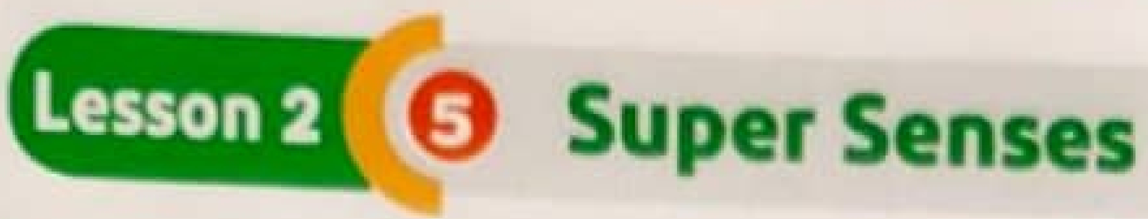
(C) Label this boy's picture to show the senses associated with the parts of the body. Use the given words:

(smell – taste – see – hearing – touch)

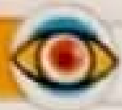




LEARN



Lesson 2 (5) Super Senses



Activity — Observe Like a scientist

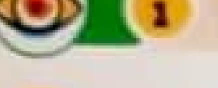


Warm-up

- Are you able to see things easily in the dark? Yes ☐ No ☐
- If you can't, can you use another sense? ________________.

____

(1) Nocturnal animals can use other senses other than sight to get food in the dark.



Examples:

Snake



Bat



Owl



Definition

Nocturnal animals:

They are night-active animals that get food without needing light.

Causes of nocturnal animals' night activity.

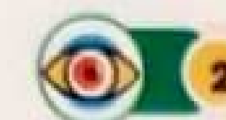
Look for food in night times avoiding the extremely hot places.	The food of some animals is available only at night.	Some animals rely on the cover of darkness to surprise their prey.

Parents' Tips:

Help your child take a closer look at how specialized senses help animals find food.



LEARN



2 Super sensory adaptations help animals navigate darkness safely and search for foo

Example 1:

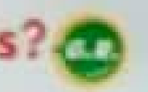
Snake



- Snakes have the ability to sense heat of the prey using a specialized body part in their face.
- They can detect the position of their prey in complete darkness.



Conclude Like a Scientist

- **Snakes use heat to hunt. Why is this special sense useful to snakes?** 



Answer

Snakes are unable to see at night, so they use their sense of heat to find their prey

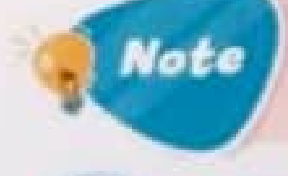
Example 2:

Bat



- Bats rely on echolocation to get food like dolphins
- Bats bounce sounds off objects to find food and get around.





Note Bats must hunt in the dark unlike dolphins although both use echolocation for huntin



Conclude Like a Scientist

- **How do bats catch rats in the dark?**



Answer

.They can't see very well in the dark, so they use echolocation or echoes, to help them hear where their food is.

food.

y

r prey.

lphins.

nd get

r hunting.

Example 3: Owls have both extraordinary sight and hearing senses which are described as follows:



1

- Bowl-shaped face and specialized head feathers.
- Both features direct the distant sounds directly into the owl's ears.

2

It has the ability to turn its head all the way around to search for prey in every direction.

3

The large owl's ears detect the small and distant movements of certain animals that make noise and hide between the grass or under the ice.

Conclude Like a Scientist

- **How does the shape of an owl's head help it hear what it cannot see?**

Answer

The owl's bowl-shaped face picks up distant sounds and amplifies them.

Apply Like a Scientist

(Answer Guide: P. 4)



Choose the correct answer:

1. Nocturnal animals are .... active animals.
   a. day b. night c. day and night.
2. Bat uses the sense of .... to find its food.
   a. hearing b. sight c. feeling
3. Owl's head turns in .... to find food.
   a. one direction b. two directions c. all directions
4. Some animals can find their food in the dark by ....
   a. sensing the heat of prey b. hearing echo
   c. (a) and (b)



LEARN

6 Pizza and the Nervous System

Activity  Analyze Like a Scientist

 **Warm-up**

- What is the sense you use to know the type of food if you can't see it? (Tick)

☐ Sight ☐ Touching ☐ Smelling



 1 **The Nervous System**

- As we learned, the brain is responsible for the responses as feeling, tasting, hearing or seeing. The brain is the most important organ of the Nervous System.

The nervous system of mammals such as (humans, elephants and dogs) consists of

Nervous system is made up of:

The Brain	Spinal cord	Nerves



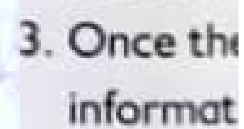




 2



1. The sens
2. Smell ne
   the brain
3. Once the
   informat





Parents' Tips:

Help your child explore how humans collect information through the senses and how the parts of the nervous system carry information to the brain.



1 Brain

The brain is connected to a big nerve that runs through the backbone called the spinal cord.

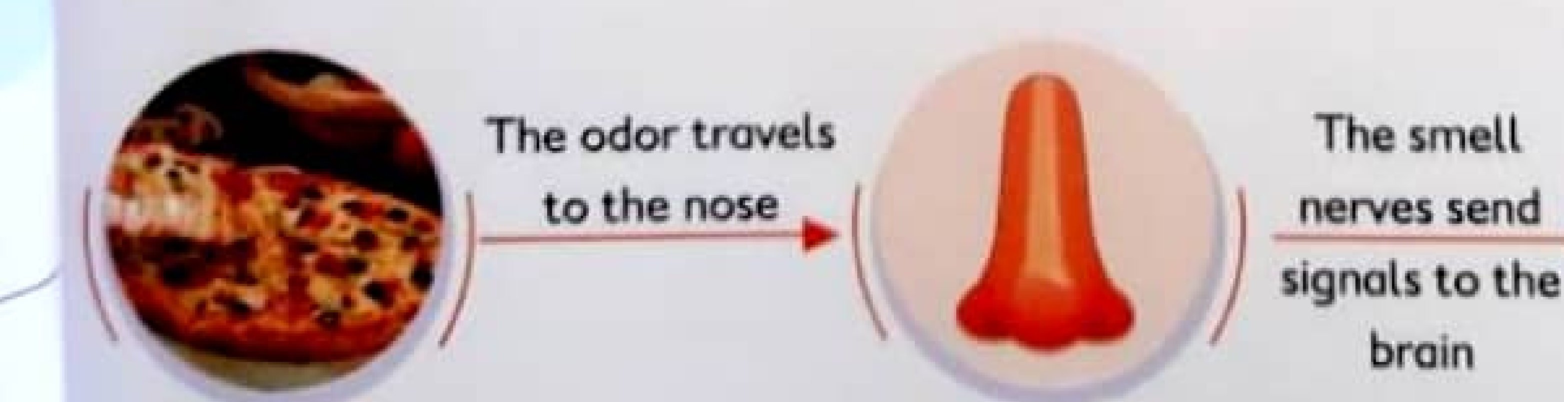
The brain is connected directly to some nerves such as eyes and heart nerves.

2 Spinal cord

It is branched into smaller and smaller nerves which are distributed throughout the body.

2 How does the nervous system work if you smell pizza?

1. The sensory organ (the nose) receives the information from the environment (the pizza's odor).
2. Smell nerves which exist back the nose send signals in the form of electrical impulses to the brain.
3. Once the information of smell reaches the brain, it can determine what to do with that information, including how to react.







Conclude Like a Scientist

- Mention the function of each part of the nervous system.

Answer

Parts of the Nervous System

The Brain	Spinal cord	Nerves
the main control center in an animal body.	helps carry messages to and from the body and brain.	carry messages from the brain through all the body.

Apply Like a Scientist

(Answer Guide: P. 4)

Complete the following sentences using the given words:

(Nerves - nervous system - brain)

1. The .... is like the command center for your body.
2. .... send(s) messages to the brain.
3. The brain is a part of the ....

7 Optional digital activity

Processing Sensory Information.

For More Knowledge about processing sense information in humans and animals brain, use the Egyptian Knowledge Bank.



Lesson 3  Sensing the Environment



Activity — Evaluate Like a Scientist

Warm-up

- The five senses and the body systems work together to enable us adapt with the environment.

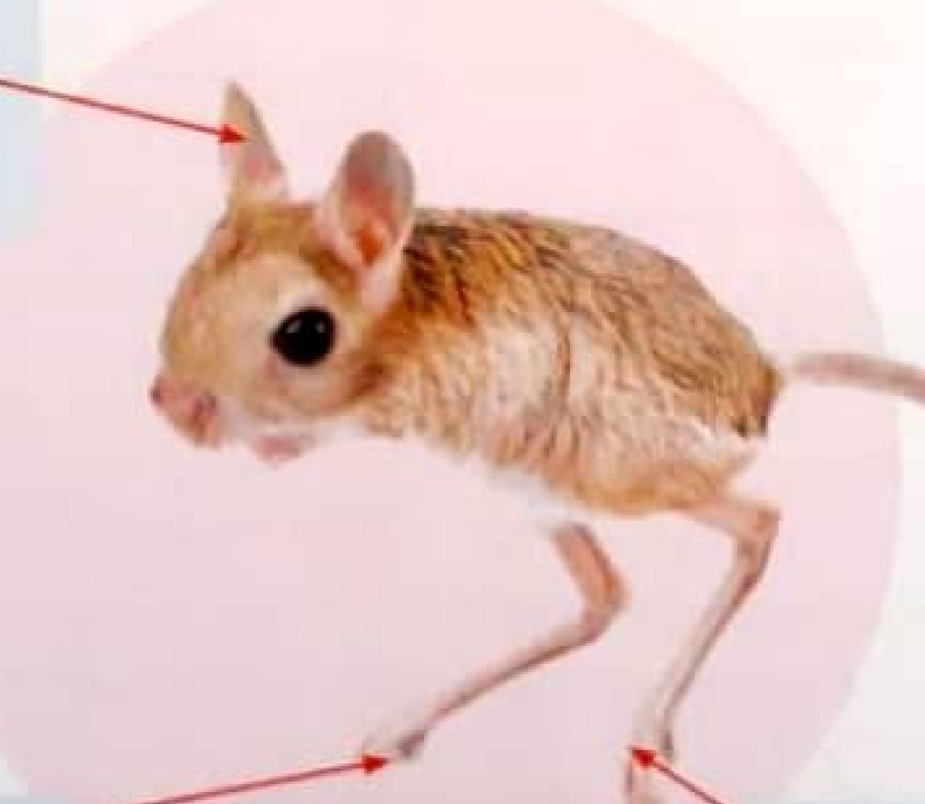
- Now, we are going to learn how the keen senses of some animals work with different parts of the body to avoid danger.



1 Jumping jerboa

The Egyptian jerboa is a desert rodent that is active at night searching for food.
The features of the jerboa body.

Ears:
- Large and sensitive
- Can detect snakes and vipers, even if they are small and quite.

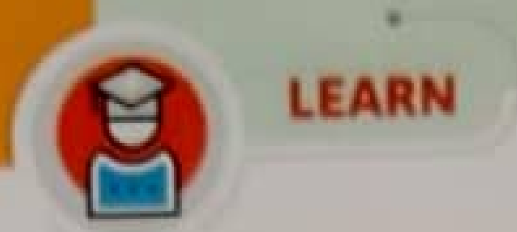


Feet:
- There is hair on its feet and toes to help it to grip the sand as it hops and jumps.

The back legs:
- They are long hind legs which enable it to jump long distances.

Parents' Tips:

Help your child understand how both adaptation and the nervous system help animals survive.



2 How does jerboa avoid danger?

- When vipers attack jerboa to devor it, the jerboa becomes alert and reacts to danger

When snakes make noise → Sensory receptors in the jerboa's ear send a message. → Through a network of nerves to the brain. → The brain translates this message and sends a response to its legs. → Jerboa's legs are related and start to move. It jumps in zigzag paths to escape quickly from danger.

- The jerboa's sharp sense of hearing and its strong legs for jumping work together with its nervous system.
- This entire process happens a fraction of second.

Definition

The reaction time:

It is the time taken by a jerboa to react to danger.



Conclude Like a Scientist

- **How does jerboa's physical response to danger compared to that of a human?**

Answer

Humans	Jerboa
They do not have to run from predators.	It jumps in a zigzag pattern to escape quickly from danger.
Both rely on sensory receptors, nerves and a brain to sense and communicate messages.	

Apply Like a Scientist

(Answer Guide: P. 4)

Write the scientific term:

1. It is the time taken by a living organism to respond to a danger. (..............)
2. It enables the jerboa jump long distances. (..............)
3. The body organ that enables jerboa to receive snakes' sounds. (..............)

9 Optional digital activity

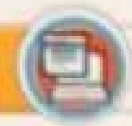
Nerves

For more knowledge about nerves and their types, use the Egyptian Knowledge Bank.





Lesson 4 ⑩ Hands-on Investigation: Reaction Time



Activity — Investigate Like a Scientist



Warm-up

- When someone calls you while you are walking, your ear receives the sound waves and sends them to the brain to translate them and alert your body to turn to see who is calling.

Definition

Reaction time:
The time taken by a living organism to receive and respond to the surrounding information from the environment.



Aim: 1- Calculating the reaction time that is taken to catch the meterstick that is dropped (using the sight sense).

Materials: A long meterstick - chair - calculator

Work with your partner to carry out the following steps.

Steps

1. One partner will drop the stick.
2. The other partner will catch it when he sees it fall.
3. Repeat the experiment two more times with your partner.
4. Record the measurements of the distances the stick takes to drop before your partner catches it in the Reaction Time Data Table.
5. List the three distances in order from the least to the greatest and circle the distance in the middle, then write this number in the median distance column.

Trial 1 (cm)	Trial 2 (cm)	Trial 3 (cm)	Median Distance (cm)	Reaction Time
....	....	....	....	....

6. Use the meter/ second conversion chart to convert median distance to reaction time.
7. Record the time in the final column of the Reaction Time Data Table.

Distance (cm)	5	10	15	20	25.5	28	43	61	79	99	122	176
Time (sec)	10	14	17	20	23	25	30	35	40	45	50	60

Role of the sight sense in this activity:

The eyes saw the meterstick drop and send signals to the brain through nerves, the brain processes the information and send messages to the muscles in hands to grasp the stick.

Parents' Tips:

LEARN

Activity

2- Calculating the reaction time that is taken to catch th[e] meter stick that is dropped (using the hearing sense).

Materials: A long meterstick - chair - calculator

Steps	Illustrat[ion]
1 Repeat the above activity, covering the eyes of your partner who will catch the stick.	
2 Say the word "now" before letting the stick go.	
3 Record the distance that the stick takes to drop before holding it.	
4 Repeat the steps three times and record the measurement in the following table, then circle the median distance.	

Trial 1 (cm)	Trial 2 (cm)	Trial 3 (cm)	Median Distance (cm)	Reaction Time
....	....	....	....	....

5 Use the following table to convert median distance to reaction time.

Distance (cm)	5	10	15	20	25.5	28	43	61	79	99	122	176
Time (sec)	10	14	17	20	23	25	30	35	40	45	50	60

Role of hearing in this activity:

The ears receive the sound and transmit messages to the brain through the nerves, and the brain processes the information and transmits messages to the muscles of hand in order to hold the meterstick.

Observation:

- You can hold the ruler faster when you see it.
- Your brain can process what you see faster than what you hear.

Conclusion:

- The reaction time varies based on the type of external information.



Conclude Like a Scientist

- **Why is it important for each person to do multiple trials of the activity ste[p]**



Because the person may distract in one trial, multiple trials improve the accura[cy]



Conclude Like a Scientist

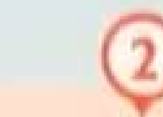
- -What are examples of when reaction time is important in the world around us?

Answer



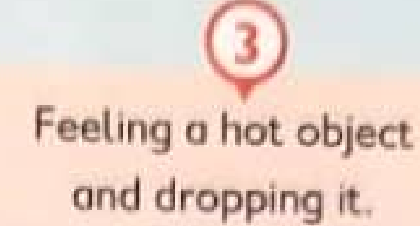
Seeing a red traffic light and pressing the car brakes.



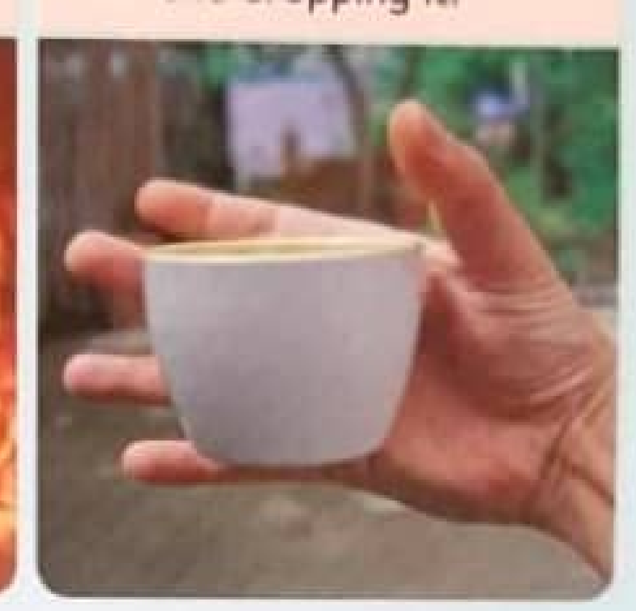


Hearing a fire alarm and lining up for a fire drill.





Feeling a hot object and dropping it.

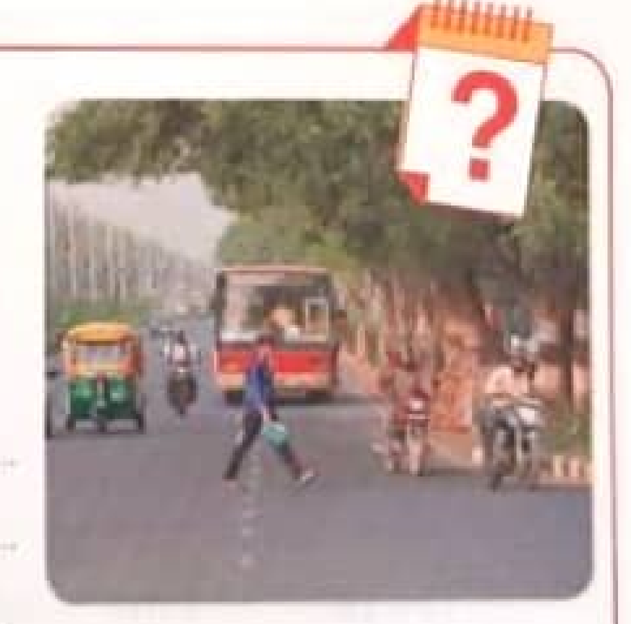


Apply Like a Scientist

(Answer Guide: P. 4)

A car driver wants to warn a man crossing the road, which method is the suitable one to alarm this man? And why?

The sound of car horns ☐ The flashing light ☐

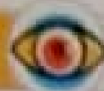




LEARN

Lesson 5 (11) How the Nervous System Work



Activity  Observe Like a scientist



Warm-up

- The nervous system gathers information about what is going on inside and outside the body and sends this information to the brain.

1 Functions of the nervous system:

- The Nervous system performs 3 main functions.

Jobs of the Nervous System



1. Gather information through the sensory organs like eyes, ears and even skin.



2. Make sense of it (translate the information).



3. Tell the body what to d[o] based on that informat[ion]

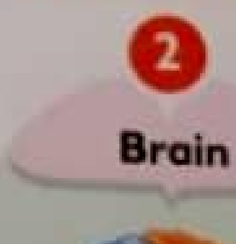
What happens when you hear a chirping bird?



1 Sense Organs



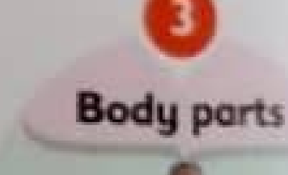
The ears pick up sound waves coming from a chirping bird, the nerves in ears send a message to the brain.



2 Brain



The brain makes sense of the sound waves to let you hear the sound.



3 Body parts



The brain sends a mess[age] to the body about wha[t to] do, such as turn to loo[k at] the bird in a tree.

Function of sense organs:

They are responsible for gathering information about what is going on in and out of the b[ody]

Parents' Tips:

Help your child combine what he/she knows about sensory and motor input to describe how parts of the nervous system work together.





2 Reflexes



- Some messages are so fast that you are barely aware of them, these messages are called reflexes such as blinking your eyes when something gets closer to the eyes.



Note Other messages are relayed to and from the brain automatically like the signal to breathe.



Definition

Reflexes

Messages that the nervous system sends so quickly that you won't be able to control.

Apply Like a Scientist

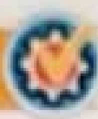
(Answer Guide: P. 4)



Complete the following:

1. .... collects information and sends it to the brain.
2. .... is responsible for processing information.
3. .... are messages that the nervous system sends so quickly that you don't think about them.
4. The functions of the nervous system are .... , ... and ....



 Describing the Nervous System

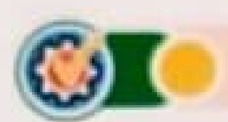
Activity Evaluate Like a Scientist



Warm-up

- Do you think the brain can receive information from sense organs and tell the body what to do, without nerves?

Yes ☐ No ☐



The parts of the nervous system:

- Look at the following pictures, then match each organ with its picture and function.





Brain	Spinal cord	Nerves
Carry messages from the brain through all the body.	The main control center in the body.	Carry messages to and fro the body and the brain.



Conclude Like a Scientist

- What can the parts of the nervous system do together that each individual part cannot do alone?

Answer ....

The parts of the nervous system work together to:

Sense the environment.	Interpret the information to decide the best action.	Then send a signal to the body to react.

- Without all of the parts of the nervous system, the person might not receive, send, or react to the information.

Apply Like a Scientist

(Answer Guide: P. 4)

- Complete the following paragraph using the given words:

(harms – cold – hot – pain)

- The nervous system makes us feel .... , know things .... or .... and protects us from ....



Your Nervous System

For more knowledge, about your nervous system and its structure, use the Egyptian Knowledge Bank.



https://study.ekb.eg/



Al-Adwaa Exercises

on Learn Activities *(Answer Guide: P. 4)*

1 Choose the correct answer:

1. The brain interprets what you see .... what you hear.
   a. as well as b. slower than c. faster than
2. The .... are the signals transmitted from and to the brain too fast to be controlled.
   a. reflexes b. response c. sense organs
3. Snakes are able to detect heat through heat sensors on their ....
   a. tail ends b. skin c. face

2 "True" or "False":

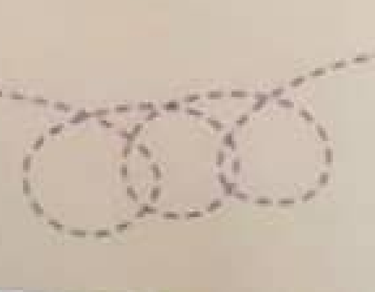
1. In the extremely hot areas, the best time to search for food is during daytime. (
2. Owls can rotate their heads in all directions. (
3. The mammals' nervous system consists of "Brain", "Spinal cord" and "Nerves". (
4. Jerboa's skinny feet enable it to hold the sand. (

3 Complete using the given words:

sensory organs - spinal cord - Ear - sensory nerves - body systems - hearing

1. .... is the sensory organ that can respond to the noise.
2. .... receives the information from the environment, while the .... send signals to the brain.
3. The .... extends from the brain down through the backbone.
4. Senses integrate to work with .... in order to survive.
5. Jerboa's sharp sense is ....








4 Write the scientific term for the following:

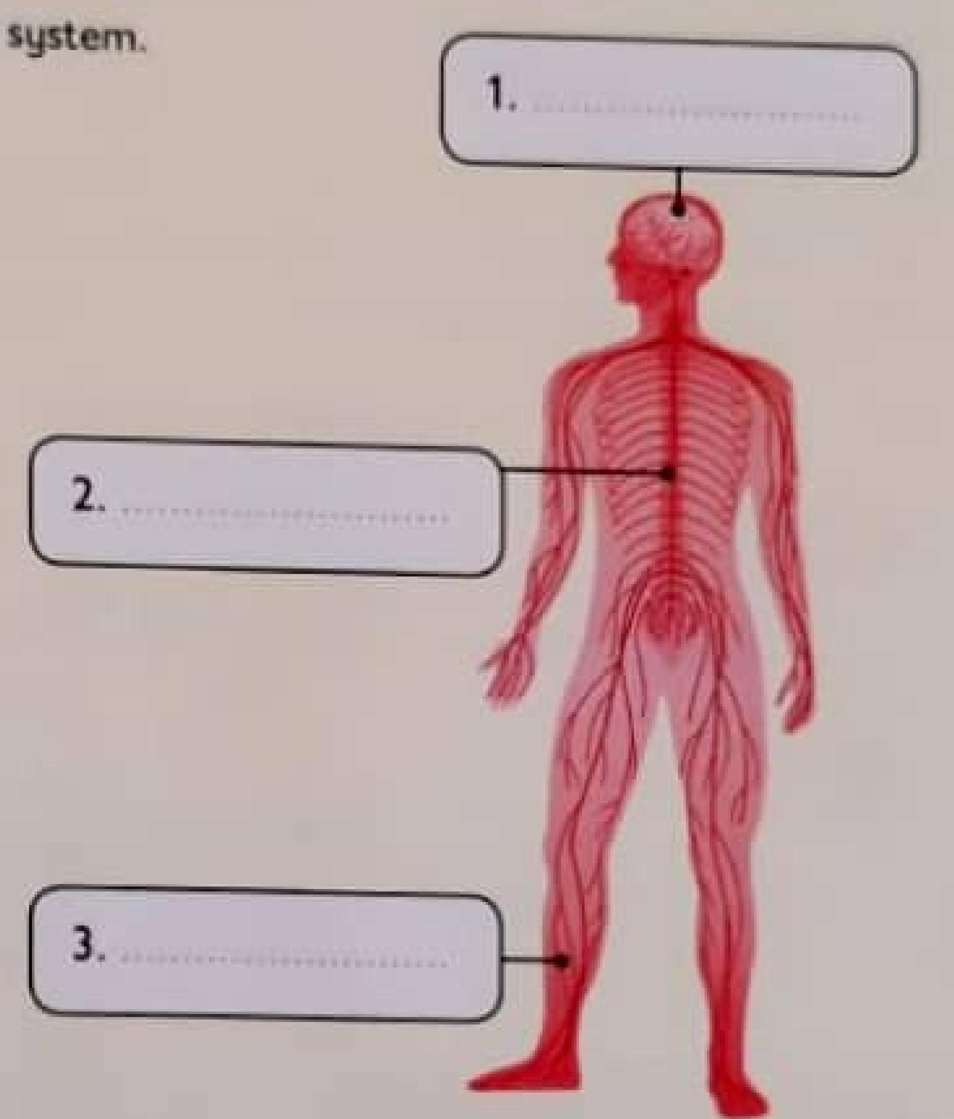
1. They are the night-active animals. (..........)
2. The time taken by an animal/ a human to receive and respond to the information from the environment. (..........)

5 Look at the following figure, then answer:

a. Label the different parts of the nervous system.

1. ....
2. ....
3. ....

b. The part that is responsible for processing information is ....







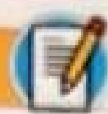
SHARE



Lesson 6 (14) Record Evidence: Dolphin Super Senses



Activity: Record Evidence Like a Scientist



How can you describe dolphin super senses now?

- Dolphin uses its sense of hearing echoes to detect fish places.

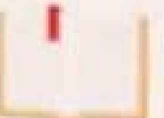


Definition

Echolocation:

It is a way that some animals such as whales, bats and dolphins use to locate the places of prey and other objects by hearing the echo of sounds produced by them.

Can you explain like a scentist, how do animals sense and process information?



Claim:

Animals use their nervous system to sense and process information.

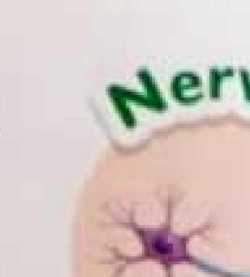
Evidence:

- Nerves send information from our senses to the brain.
- The brain processes and makes sense of information.
- Our senses can't process information without the nervous system.

Scientific Explamation:



Receive information from the environment and transmit it through the nerves.





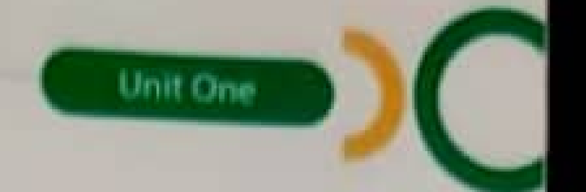


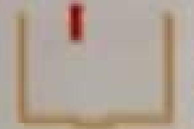
To

Send responses to sense organs.

Parents' Tips:

Help your child revise what he/she had learned through the concept.





Definition

Sense organs

They are responsible for collecting information about what happens outside and inside the body.

Reaction time

The time taken by a living organism to receive and respond to the surrounding information from the environment.

Reflex action

They are messages that the nervous system sends so quickly and we won't be able to control them.

Some animals are called nocturnal animals, that are active during the night and have superior sensory abilities.



It depends on the sensation of prey's heat by a specific part of its face to locate the prey.



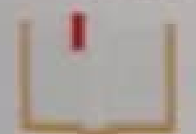
It depends on eye sight and hearing to locate the prey.



It depends on echolocation to locate the prey.



It depends on its large ears to listen predators and depend on its legs to escape.



Definition

The Nocturnal animals

They are night-active animals that get food without needing light.



Careers: Become a Neuroscientist

For more knowledge about the Neuroscientist career and how he can help human, use the Egyptian Knowledge Bank.



https://study.ekb.eg/



16 Review: Senses at Work

Activity  **Evaluate Like a Scientist**

- Complete the following diagrams to create a concept summary, then share it with your classmates.

Five senses and sense organs



Functions of the parts of the nervous system.



1. .... organs receive information from the surrounding environment.
2. .... transmits the external information to the brain.
3. The .... interprets the nerve messages and sends responses to the organs.
4. The .... transmits the messages from the brain to the organs and vice versa.

Parents' Tips:
Help your child make a summary about the concept.

Exercises on Concept 2 (Answer Guide: P. 4)

1 Choose the correct answer:

1. .... , ... and .... are the components of the nervous system.
   a. Brain, spinal cord and nerves
   b. Brain, heart and nerves
   c. Nerves, spinal cord and eyes
   d. No correct answer

2. How is your nervous system like a pizza delivery restaurant?
   a. It needs fuel to run efficiently.
   b. Orders are sent out based upon the different messages that come in.
   c. It can take a long time for messages to be delivered and sent out.
   d. Not everyone sends their orders to the same location.

3. Azza suddenly woke up and smelled something burning, then she crept down (hurried) to see what was happening, she found her parents sitting and reading next to the fire place, where wood was burning. So why did Azza wake up?
   a. The smell of fire sent a signal to the brain through the blood cells and she woke up.
   b. The smell of fire sent a signal to her brain through the nerves, and she woke up.
   c. Azza's nose was stuffy from a cold and she couldn't sleep.
   d. Azza was too cold to sleep.

4. The suitable order for the brain to interpret and send a response to an external information is ....
   a. sense organs receive the external information, then the nerves send it to the brain that interprets it and sends response.
   b. the brain receives the external information, then the sense organs send it to the organs that interpret it and send response.
   c. (a) and (b)
   d. no correct answer

5. .... is a nocturnal animal.
   a. Jerboa
   b. Owl
   c. Cat
   d. All the previous answers

6. .... is/are responsible for hearing.
   a. Ears
   b. Nose
   c. Tongue
   d. Nerves

7. All of the following are sense organs except ....
   a. ears
   b. nose
   c. tongue
   d. nerves

2 Complete the following sentences:

1. Bat is a .... animal, that is active at night.
2. In echolocation, the delay in the echo determines the object is ....
3. The sense organs are ...., ..., ..., ... and ....
4. .... seems like the computer processor.
5. The nervous system consists of ...., ... and ....
6. The brain processes what we see .... than what we hear.
7. We can distinguish between the smell of benzene and perfume by ....
8. Animals' very large ears enable them to ....

3 Match the sense organ from column (A) to the stimulus that suits it in column (B) with respect to the information collected by each sense organ:

(A) Sense Organ	(B) Information
1. Hand	a. Light coming through an open window
2. Eyes	b. A skunk's foul scent
3. Tongue	c. Heat from a hot stove
4. Ears	d. The bitter taste of lemon
5. Nose	e. Loud noise blasting from the car horn

1-.................. 2-.................. 3-.................. 4-.................. 5-..................

4 Put (✓) or (✗):

1. The brain is the organ that sends signals for breathing. ( )
2. The nervous system consists of the brain and nerves only. ( )
3. Reaction time varies depending on the type of information. ( )
4. The main control center of the body is the spinal cord. ( )
5. Each part of the nervous system works alone without integration with the rest of the organs. ( )
6. The brain does not need nerves while producing its functions. ( )

5 Write scientific term:

1. A way that some animals do to determine the location of things by producing sound waves and listen to the echo. (..................)
2. The sense organ which is responsible for smelling. (..................)
3. The organ that translates external information and sends response. (..................)
4. Nocturnal animal that is active at night. (..................)
5. The main control organ in the nervous system. (..................)
6. Messages that the nervous system sends quickly to the body organs that you will not be able to control them. (..................)

6 What happens if...?

1. Jerboa hears noise and feels danger.
....
2. Touch a sharp thorns of a plant.
....
3. A strange object gets closer to your eyes.
....

7 Write "True or False" to determine whether the following sentences are related to the nervous system or not:

1. Nerves receive information from the senses and send them to the brain even if the person is sleeping. (..................)
2. When a person walks barefoot on a sharp rock, the brain is the last organ to react to the information. (..................)
3. Sensory organs of the nervous system work alone when the brain is busy performing other functions. (..................)
4. The brain stores information in case the hand is burned to remind the person to keep his hands away when he feels hot. (..................)

8 Rearrange how the brain interprets information. (Put number 1 in front of the first process and number 4 in front the last process):

- [ ] Nerves in the body connect sensory organs to the brain.
- [ ] The sensory organ receives information from the environment.
- [ ] The brain determines what to do with the information.
- [ ] Signals move like electrical pulses from the organ to the nerves until they reach the brain.

Concept 3 Light and Sight



Concept Objectives

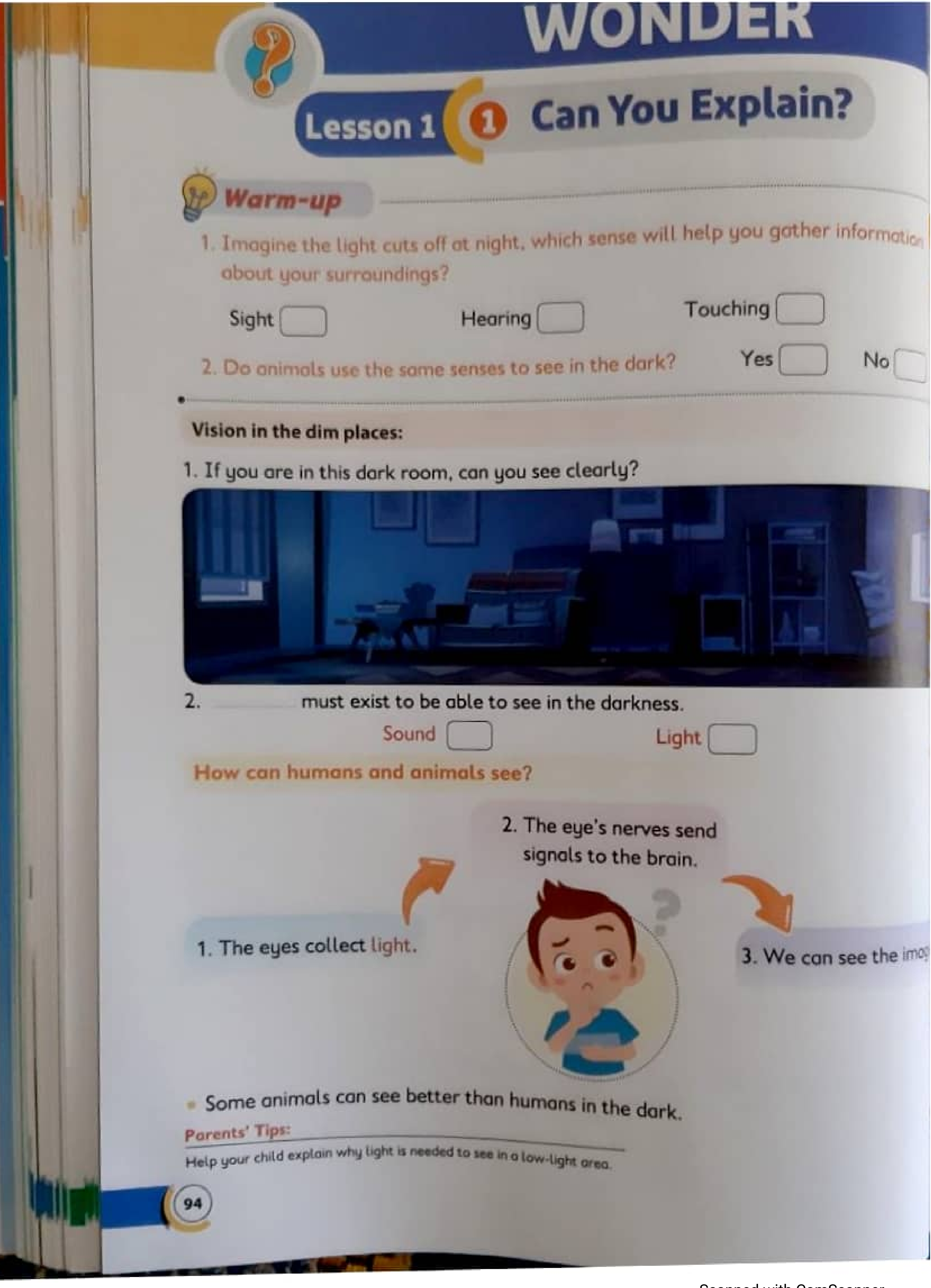
By the end of this concept, the student will be able to:

- Describe how light transfers energy across distances.
- Develop a model that describes how the behavior of light enables the eye to see objects.
- Explain how adaptations help some animals gather information in the dark.

"Pacing Guide"

Section	Lesson	Activity	Key Terms	Life Skills
WONDER	1	**1 Can You Explain?** • Students use prior knowledge to construct an explanation of why light is needed to see in a low-light area.	———	I can share ideas I am not yet sure about.
WONDER	1	**2 Hunting with Night Vision** • Students ask questions about the relationship between light and sight.	Light	———
WONDER	1	**3 What Do You Already Know About Light and Sight?** • Students communicate current understandings of how light sources play a role in vision.	Reflect	———
LEARN	2	**4 Hunting in the Dark** • Students read a text and view images to explain the abilities of humans, cats, and tarsiers to see in dark places.	Pupils	———
LEARN	2	**5 Hands-On Investigation: Light Observations** • Students explore how light is related to sight.	———	I can think about how my team works together.
LEARN	3	**6 Light Is Energy** • Students gather evidence for how vision works in low light and how light transfers energy from one place to another.	———	I can apply an idea in a new way.
LEARN	3	**7 Special Eye Structures** • Students will look for evidence to explain how some animals' eyes are structured to use light reflection in order to function exceptionally well in low light conditions.	Feature	———
LEARN	4	**8 Hands-On Investigation: Reflection** • Students plan and carry out an investigation about which types of objects best reflect light.	———	I can analyze a situation.
LEARN	4	**9 Light Strikes Matter** • Students look for evidence to explain how light behaves when it interacts with different types of matter.	- Opaque - Transparent - Matter	———
LEARN	5	**10 Sight Model** • Students use the model of a bouncing ball to study the behavior of light.	———	I can apply an idea in a new way.
SHARE	5	**11 Record Evidence: Hunting with Night Vision** • Students explore the relationship between light and vision to construct explanations about how we see in the dark.	———	I can review my progress toward a goal.
SHARE	6	**12 STEM in Action** • Students evaluate a text to communicate information about how optometrists help people see more clearly.	———	———
SHARE	6	**13 Review: Light and Sight** • Students summarize their learning about light and sight with a written explanation and by completing a concept summative assessment.	———	———





Lesson 1 (1) Can You Explain?

Warm-up

1. Imagine the light cuts off at night, which sense will help you gather informatio about your surroundings?

Sight ☐ Hearing ☐ Touching ☐

2. Do animals use the same senses to see in the dark? Yes ☐ No ☐

Vision in the dim places:

1. If you are in this dark room, can you see clearly?

2. .... must exist to be able to see in the darkness.

Sound ☐ Light ☐

How can humans and animals see?

1. The eyes collect light.

2. The eye's nerves send signals to the brain.

3. We can see the ima

- Some animals can see better than humans in the dark.

Parents' Tips:

Help your child explain why light is needed to see in a low-light area.

2 Hunting with Night Vision



Activity  Ask Questions Like a Scientist



Warm-up

- Do you know any animals that can see in the dark?

Yes ☐ No ☐



Night vision:

- Some animals are able to see clearly in dim light, such as cats.
- Cats eyes are unique due to the presence of a mirror-like membrane, on the back area of the eye.
- This membrane acts to bounce the light to allow the eye to collect more light.

Example:



- A wild cat whose eyes seem to glow in the dark, which helps in hunting its prey.
- This adaptation allows cats to have excellent night vision to hunt successfully in the dark (Structural adaptation).



Note Our eyes require light to see well, without it we would need a set of night vision to see in the dark.



Search the internet

- Do all animals have this thin membrane to see in the darkness?

Parents' Tips:
Help your child ask questions about the relationship between light and vision.





3 What Do You Already Know About Light and Sight?

Activity  Evaluate Like a Scientist



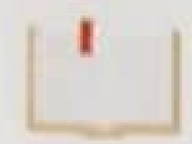
Warm-up

- If you are in a dark room, what will you use to see?

☐ Candle Magnifying lens ☐

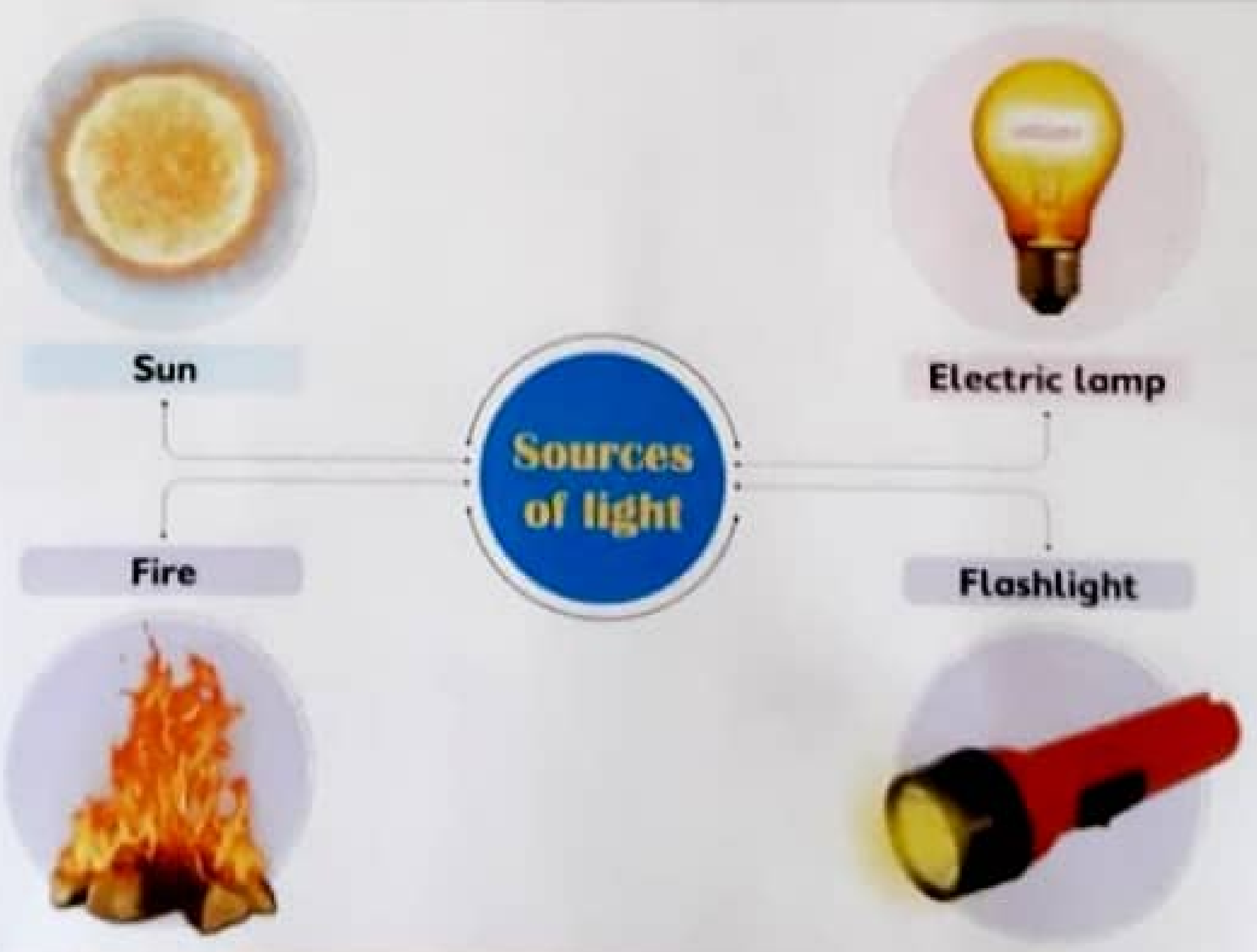


1 Sources of light:



Definition

A source of light: Is something that gives off its own light.

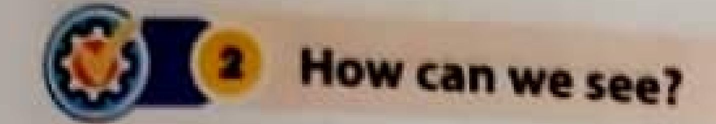




Note Moon is not a source of light, but it reflects the sunlight falling on its surface.

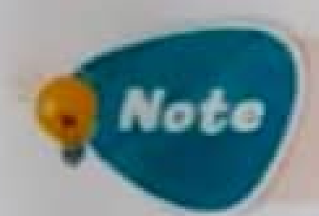
Parents' Tips:

Help your child understand how light sources play a role in vision.



How can we see?



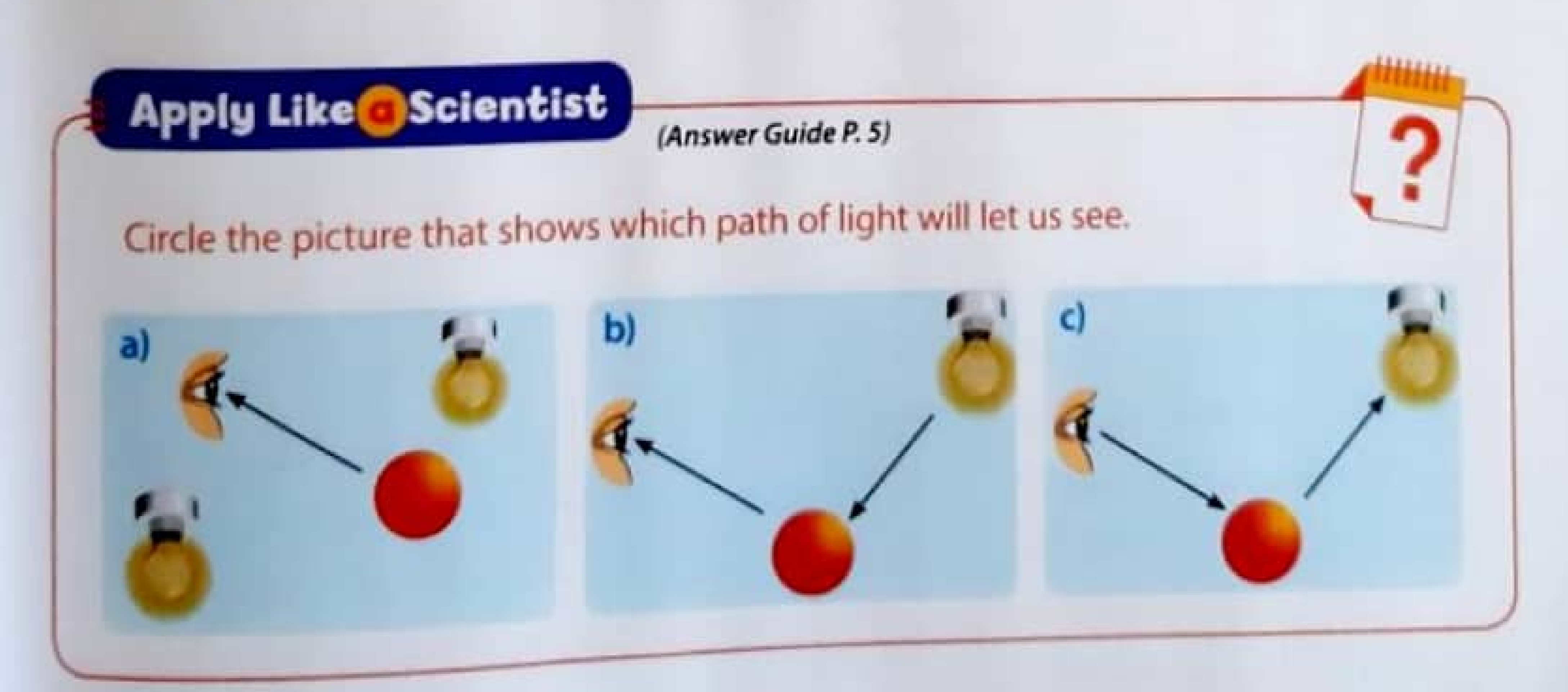


Eyes don't emit light, but light falls on objects and then reflects into the eye, so we can see.

Apply Like a Scientist

(Answer Guide P. 5)

Circle the picture that shows which path of light will let us see.



Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 5)

1 Choose the correct answer:

1. Light must exist to .... living organisms see.
   a. allow b. prevent c. let blind
2. Living organisms adapted to see in the darkness are ....
   a. blind b. nocturnal (night active) c. diurnal (morning active)
3. The thin membrane in the cats' eyes is considered a .... adaptation to see in the dark.
   a. structural b. behavioral c. No correct answer

2 Complete using the given words:

(**cats - falls - night vision devices - humans - reflects - fire**)

1. Humans use .... to see in the darkness.
2. .... is a source of light.
3. .... are adapted to see in the darkness, while .... are not.
4. The light .... an object, and then .... into our eyes.

3 Put (✓) or (X):

1. Fishing cats' eyes shine in the dark. ( )
2. All animals and humans are adapted to see at night. ( )
3. Eye nerves send messages to the brain, so we can see the image. ( )
4. Moon is a source of light. ( )
5. Most cats have a thin membrane on the back of their eyes that enables them to see in the dark. ( )
6. Humans can see in the darkness, like some animals. ( )



Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 5)

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Al-Adwaa Exercises on Wonder Activities

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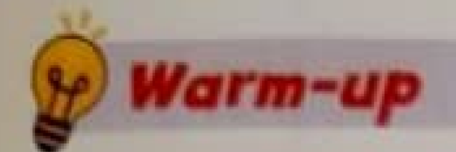
3 Put (✓) or (X):

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3. Eye nerves send messages to the brain, so we can see the image. (
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Lesson 2 ④ Hunting in the Dark

Activity: Observe Like a Scientist



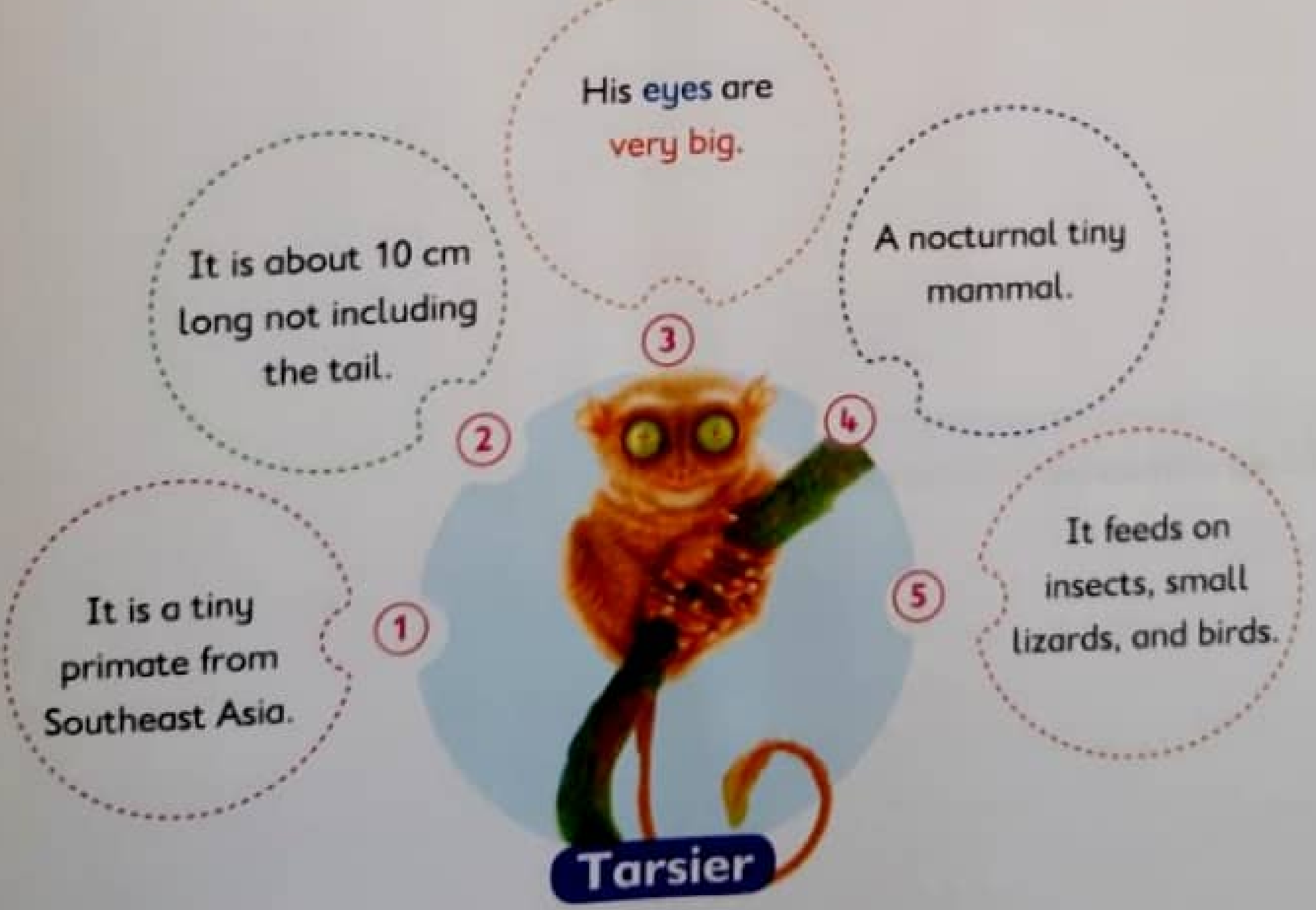
We can see things because ....

our eyes emit light. ☐ light falls on things and reflects into our eyes. ☐

- Some animals have different eyes than ours.
- Specially nocturnal animals, have bigger eyes and wider pupils than humans to let in more light.

Visibility in dim places for animals:

- We will study one of the nocturnal animals and identify the structure of his eye that enables him to see in dark places.



Parents' Tips:
... the ability of humans, cats, and tarsiers to see in dark areas.



LEARN

- Its large eyes collect and reflect light back to get a clearer picture of its surroundings.
- Like owls, it can't move its large eyes in their sockets.
- In order to be able to see left and right, it can turn its head about 180 degrees.



Conclude Like a Scientist

- **Why are some animals adapted to see at night?**



Answer

Some animals hunt their prey at night and others need to avoid predators.



Note Animals can detect very faint light levels, but in complete darkness, they rely on other senses, such as hearing, smell, and touch.

- **Compare between:** humans, cats, and tarsiers according to how they adapt to see in the dark:

Humans	Cats	Tarsiers
The eye does not collect much light, so it needs a light source.	The eye is sensitive to light due to the presence of a thin membrane on the back of the eye, so they have good night vision.	- The eye is large enough to collect much light, so it can see almost everything in the dark. - It can rotate its head in order to focus on distant or close objects in the dark.

Apply Like a Scientist

(Answer Guide P. 5)



Put (✓) or (✗):

1. The tarsier sees well at night. ( )
2. Tarsier eyes have a thin membrane in the back of the eye. ( )
3. People need light sources, especially in dark places. ( )
4. Tarsiers can see everything around them because they have very large eyes. ( )

5 Hands-On Investigation: Light Observations

Activity  Investigate Like a Scientist



Warm-up

What happens if we light a candle when the light cuts off?

- We won't see anything in the room. ☐
- We see some objects in the room near the place of the candle. ☐



The relationship between light and sight:

Activity

Aim: Identify the relationship between light and sight

Materials: a flashlight - a small box with 2 holes (the distance between them is 5 cm) - a small ball

Steps	Illustration	Observation
1 Put the ball inside the box and close the lid. 2 Cover one hole with your hand, then look through the other hole. What do you see?		• I can't see the ball.
3 Take your hand away, put the flashlight on one hole, then look again through the other hole. What happens?		• I can see the ball.
4 Increase the illumination (amount) of the flashlight, what happens?		• I can see the ball more clearly.

Conclusion

- There must be a source of light to see the objects.
- We see objects because light reflects off the objects into our eyes.





Lesson 3 6 Light Is Energy



Activity Analyze Like a Scientist



Warm-up

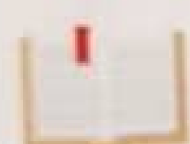
If there is no source of light, could objects be seen in extreme darkness?

Yes [ ] No [ ]



How does light travel?

- Light travels in straight lines away from the light source.

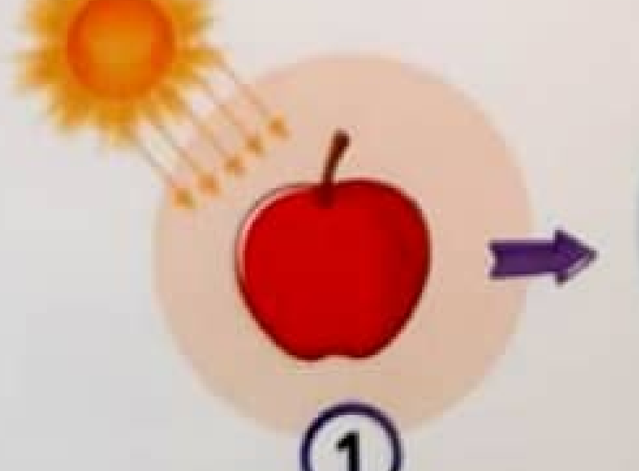


Definition

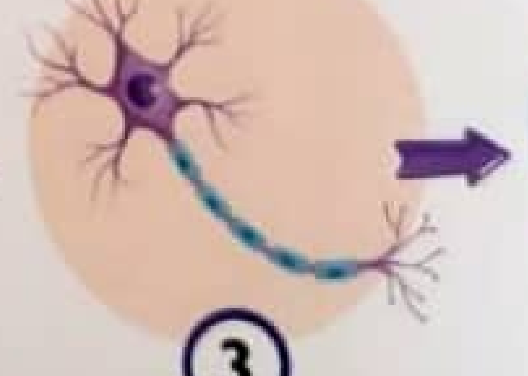
Light: Is the visible form of energy that travels in waves.



How does vision occur?









1. Light waves fall on the object, then reflect in straight lines.
2. The eye receives the reflected waves from the object.
3. The eye sends a message to the brain through nerves.
4. The bra... interpre... this mess... causing v...

Parents' Tips:

Help your child identify how vision works in low light and how light transfers energy from one place to another.

Conclude Like a scientist

- Although the presence of the brain and the sensory organ (Eye), we couldn't see in the dark.

Answer

Because without light bouncing off the objects into our eyes, everything will look black.

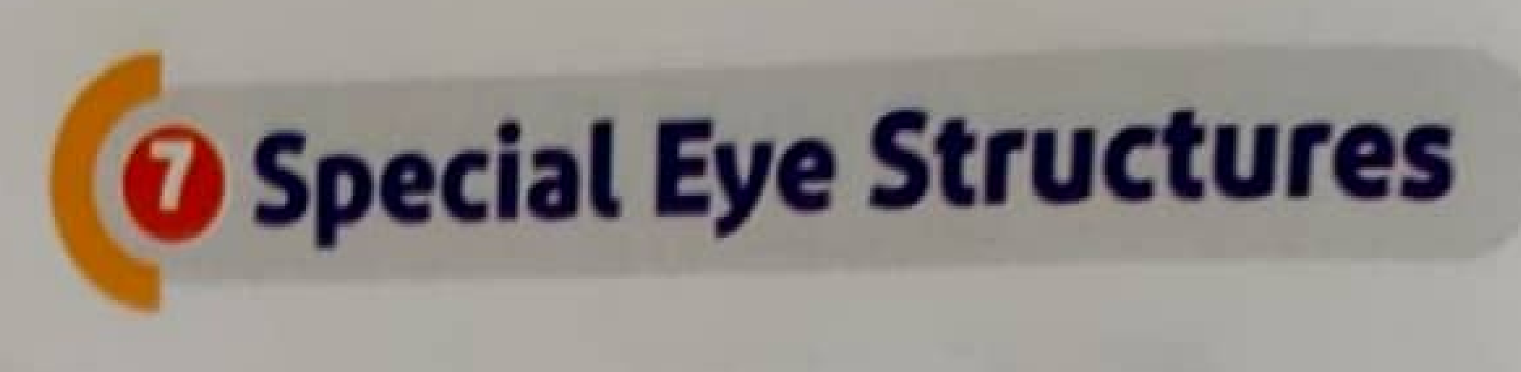
Apply Like a Scientist

(Answer Guide P. 5)

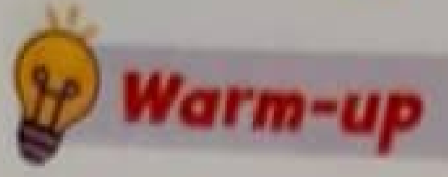
Read the sentences, then rearrange the process of vision:

- [ ] The eye sends a message to the brain through nerves.
- [ ] Light falls on the objects.
- [ ] The brain tells us what we see.
- [ ] Light reflects in straight lines into our eyes.

rain
rets
essage
vision.



7 Special Eye Structures



Activity — Analyze Like a Scientist

Warm-up

- Is there a difference in the structure of the eye of cats and humans, as you learned?

Yes [ ]   No [ ]



Structural feature in the eye of nocturnal animals:

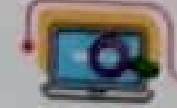
- Some animals have a special feature in their eyes, such as deer, cats, and dogs known as Tapetum lucidum "tapestry of light".

Definition

Tapetum lucidum: Is a thin layer at the back of the eye that reflects light.

- It is a life-saving adaptation for animals who either hunt at night or need to avoid being hunted.
- **Function:** it reflects light like a mirror to help the animals see better at night.
- You may have noticed once at night that when you shine a light on the eyes of cats, they glow.
- This is due to the reflection of light from the tapetum lucidum.





Search the internet

- Why do not humans have a tapetum lucidum?

Parents' Tips:

Help your child explain how some animals' eyes are structured to see exceptionally at night.



Lesson 4 ⑧ Hands-On Investigation: Reflection

Activity  Investigate Like a Scientist

Warm-up

When you stand in front of a mirror, do you see your image? ....

☐ Yes ☐ No



1 Light reflection:



Definition

Light reflection: It is the bouncing (returning back) of light rays when they fall on a reflecting surface.

Activity

Aim: Identify the reflection of light using different materials

Materials: a flashlight - a mirror - a wooden block - a piece of metal - a piece of cloth

Steps	Illustration	Observation
1 Approach the lighted flashlight toward a mirror.		• The mirror reflects most of the light.
2 Approach the lighted flashlight toward a wooden block.		• The piece of wood reflects less amount of light.
3 Repeat by using other materials.		

Conclusion

- Materials are classified according to their ability to reflect light into:

  Shiny objects: Objects that reflect most of the light rays like mirrors and metal.

  Rough objects: Objects that reflect less amount light rays like wood and clothes.

Parents' Tips:

Help your child investigate which types of objects best reflect light.



2 The path of the reflected light rays:



- From the previous experiment, we will observe that the reflected light rays bounce back at the same angle that light falls on the object.

Apply Like a Scientist

(Answer Guide P. 5)

Choose the correct answer

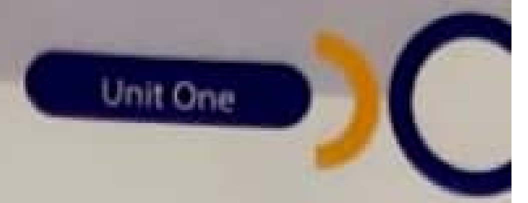
1. Which of the following materials reflects most of the light rays? ....
   a. Aluminum foil - Rocks - Mirror
   b. Metallic spoon - Tree trunk - Aluminum foil
   c. Metallic spoon - Mirror - Aluminum foil

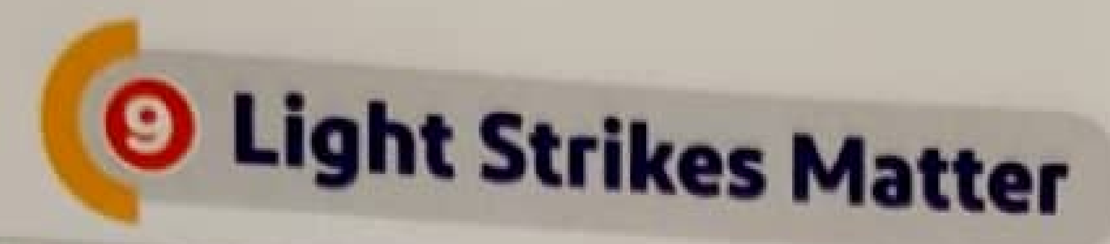
2. .... objects reflect most of the light rays.
   a. Shiny b. Rough c. transparent

3. If light falls on a shiny object at an angle, it will be reflected at the .... angle.
   a. different b. same c. No correct answer

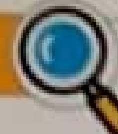
Challenge:

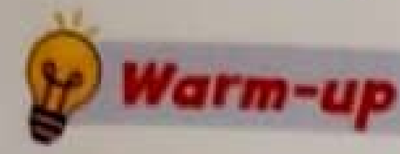
- After identifying the characteristics of shiny and rough objects when light falls on the which materials do you prefer to make a model that represents the tapetum lucidum





9 Light Strikes Matter





Activity Analyze Like a Scientist

Warm-up

What happens if light strikes a piece of cardboard?

Light passes through it. ☐ Light does not pass through it. ☐

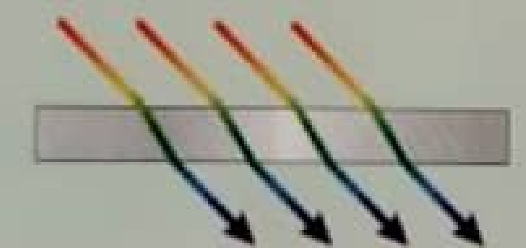


1 Interaction of light with matter:

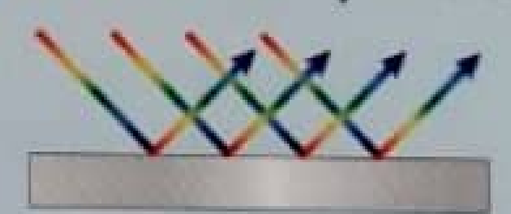
- Light is a form of energy that travels in waves called light waves.
- **When the light strikes objects:**

① Some of the light energy is absorbed.

② Some of the light energy go through the object.



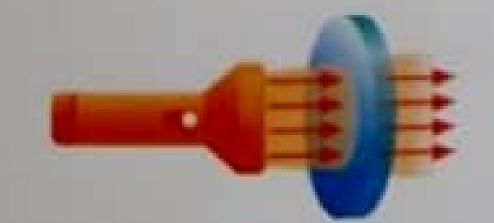
③ Some of the light energy reflects off the object's surface.



- Accordingly, objects are classified into two types:

Transparent objects	Opaque objects
• Objects that allow light to pass through. • They don't have shadows.	• Objects that don't allow light to pass through. • They have Shadows.
Ex. air – water – glass	Ex. skin – cardboard – bag













Parents' Tips:

Help your child identify how light behaves when it interacts with different types of matter.



Conclude Like a Scientist

Why do you see your shadow?



Shadows happen because all the light that hits your body either bounces off or is absorbed. None of the light passes through you.





2 Reflecting light:

- The light reflection depends upon the smoothness of the surface that falls on it:

A) Smooth surface	B) Rough surface
• If the surface is smooth as a mirror, the light rays are reflected in one direction and with the same angle.	• If the surface is as rough as a piece of wood, the light rays are scattered "diffused" in different directions.







Conclude Like a Scientist

- **If the mobile phone fell and had some cracks, how would you predict light to reflect off the screen compared to it before breaking?**

Answer

The light would reflect in different directions and it would be scattered.



Apply Like a Scientist

(Answer Guide P. 5)



Complete the following:

1. Glass is a .... object, while wood is a .... object.
2. If light falls on a .... surface, the light rays are reflected in one direction.
3. A bag is considered a .... surface.





Lesson 5 (10) Sight Model




Activity: Evaluate Like a Scientist



Warm-up

- As you learned: Light falls on the objects and then reflects to our eyes, so we can see.



Make a sight model:

Activity

Aim: **Identify how we see the reflected light rays from objects**

Materials: A bouncing ball (represents the light ray) - a chair (represents the object)- a basket (represents our eyes)

Steps	Illustration	Observation
1 • Throw the ball to hit the chair. • Observe the ball bouncing back to the basket.		• The ball bounces into the basket.
2 Repeat the previous step more time, then observe what happens?		• Sometimes the ball bounces out of the basket.

Conclusion:

- Some of the reflected light rays enter the eyes so that we can see these objects.
- Some of the reflected rays do not enter the eyes, so we do not see these objects.

Parents' Tips:

Help ... of a bouncing ball to identify the behavior of light.

Al-Adwaa Exercises on Learn Activities

(Answer Guide P. 5)

1 Choose the correct answer:

1. Nocturnal animals have __________ eyes and wider pupils.

   a. smaller   b. larger   c. same

2. __________ is a thin layer at the back of the eye that reflects light.

   a. Pupil   b. Lens   c. Tapetum lucidum

3. Tarsiers eyes are __________.

   a. small   b. normal   c. very large

4. When the light strikes __________, it doesn't allow the light to pass through it.

   a. a piece of wood   b. water   c. air

5. There is a unique structure in some animals that enables them to see at night which is called __________.

   a. pupils   b. tapetum lucidum   c. All the previous answers

6. The tapetum lucidum is one of the __________ adaptations.

   a. structural   b. behavioral   c. No correct answers

2 Put (✓) or (X):

1. Human eyes are sensitive to light due to the presence of thin membrane at the back area of the eye. (   )
2. Tarsier's head rotates 180 degrees like owls. (   )
3. When the light strikes a smooth surface, all the light rays reflect in the same direction. (   )
4. When the light falls on an opaque object, a shadow is formed behind it. (   )



3 Complete using the given words:

clear glass - illumination - carton paper - smoothness - straight - light reflection

1. By increasing the .... of a flashlight, visibility increases.
2. .... is the bouncing of light when it falls on a reflecting surface.
3. .... is a transparent material, while .... is an opaque material.
4. Light travels in .... lines away from the light source.
5. The light reflection depends on the .... of the surface that falls on it.

4 Write the scientific term for the following:

1. A layer contributes to the superior night vision of some animals. (..................)
2. A surface, where the light rays reflect in different directions. (..................)
3. Materials that allow most of the light to pass through. (..................)

5 Look at the following figure, then answer:

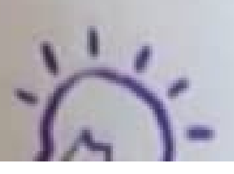
- If the mobile phone fell from your hand on the ground, and the screen broke.

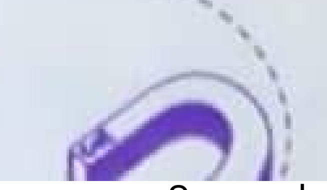
a. What would happen to the reflected light rays?

....

b. Draw the path of the incident and reflected light rays from the screen before the breaking and after the breaking.

Before breaking the screen	After breaking the screen

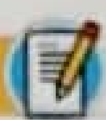






SHARE

11 Record Evidence: Hunting with Night Vision

Activity  **Record Evidence Like a Scientist**

How can you describe hunting with night vision?

- Hunting in the dark requires certain adaptations inside the animal's eye, such as the presence of a membrane called the(tapetum lucidum) in the eye, like the cat.

Can you explain like a scientist. What needs to happen for humans or other animals to see an object in low-light areas?

Claim:

Light needs to hit an object for me to see it in a low-light area.

Evidence:

- We wouldn't be able to see if there was no light source.
- There is light even in dimly lit places.
- Reflection of light from objects is what lets brain process what our eyes see.

Scientific Explanation:

- To see in the dark, people have to use night vision devices.
- Some animals can see at night better than people, such as (tarsiers - fishing cats) due to the unique features of their eyes that allow them to receive more light.



How can the fishing cats hunt by using night vision?

- It has a thin membrane in the back area of the eye that reflects the light entering it and makes its eyes shiny.



So, a wild cat can see at night accurately and hunts its prey.

- This type of adaptation is a structural adaptation.

Parents' Tips:

Help your child discover the relationship between light and vision to find an explanation for how we see in the dark.



How Do Optometrists Help Us See?

Activity  Analyze Like a Scientist



- Did you know that the eye has a lens that focuses the light that passes through it at one point on the back area of the eye?
- As magnifying glass.

What do you think if the lens doesn't focus the light correctly?

- We may have blurry vision.

Eye Imperfections

1. Some people can't see the far objects clearly.
2. Some people can't see the near objects clearly.
3. Some people can't distinguish between colors.

- Optometrists can test your eyes to determine whether the lens is focusing correctly.
- He can determine how to correct our vision with glasses or contact lenses, or maybe even using laser surgery.





After reading and studying light and sight, create a test to look for one of these imperfections.

Parents' Tips:









Science

- Examine the person to determine the kind of imperfections.
- By placing objects at different distances from the viewer and ask questions about each of the objects.

Such as: colors, shapes, and details.





Technology

- Use modern equipment to examine the person to detect and treat eye imperfections.





Engineering

- Create a geometric design for the lenses used to treat imperfections.

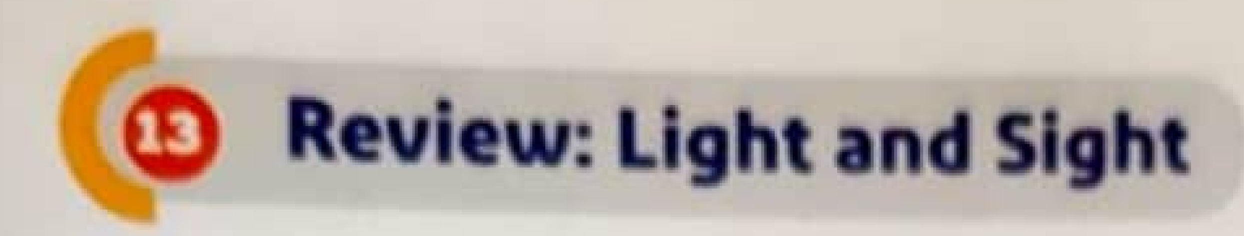




Mathematics

- Calculate the thickness of the lens used to correct the imperfections.
- Represent the eye examination in a numerical report.





13 Review: Light and Sight

Activity Evaluate Like a Scientist

Complete the following diagrams to create a concept summary, then share it with your classmates:

Light ....

Light sources

- ....
- ....
- ....
- ....

Visibility in the dark

- In Animals: ....
- In Humans: ....

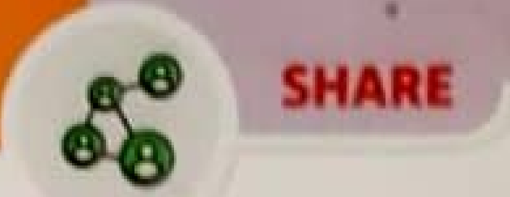
Light Reflection ....

Reflecting light

- ← If the surface is smooth ....
- → If the surface is rough ....

Parents' Tips:

Help your child summarize what he/she has learned about light and sense of vision.



Objects are classified into two types:

Transparent objects	Opaque objects
• Objects	• Objects ....
• .... shadow	• .... shadow
Examples:	Examples: ....

How does vision occur?

1. ....
2. ....
3. ....
4. ....

Tapetum lucidum

- Definition: ....
- Function ....

Exercises on Concept 3

(Answer Guide P. 5)

1 Choose the correct answer:

1. .... must exist to help us see in a dark room.
   a. The window b. The door c. A lighted lamp d. A magnifying lens
2. The fishing cat eyes .... in the dark.
   a. glow b. become narrow c. close d. both (b) and (c)
3. The cat eyes membrane .... the light that enters the eye.
   a. reflects b. absorbs c. emits d. breaks
4. The sun is the main source of light because it .... light.
   a. reflects b. absorbs c. emits d. breaks
5. Humans use a/an .... to see in the dark.
   a. night vision devices b. eyes
   c. medical glasses d. No correct answer
6. Which of the following is a source of light? ....
   a. Our eyes b. The moon c. Fire d. A mirror
7. What property of light helps you see yourself in a mirror? ....
   a. Refraction b. Reflection c. Absorption d. Relativity
8. .... tells us what we see.
   a. The heart b. The brain c. Eyes d. Ears
9. The night active animals are called .... animals
   a. nocturnal b. predators c. diurnal d. both (a) and (b)
10. The cat eyes have a thin membrane in the back of the ....
    a. eye b. lens c. brain d. No correct answer
11. A mirror and shining objects .... the light waves.
    a. absorb b. reflect c. transmit d. No correct answer
12. All the following materials reflect the light waves except ....
    a. a mirror b. foil paper c. a piece of wood d. a piece of clear glass
13. Which drawing shows how light is reflected by a mirror?



2 Complete the following sentences:

1. .... cat is a wild cat whose eyes glow in the dark, which helps in hunting its pr
2. Tarsier feeds on ...., ... and ....
3. The layer that exists at the back area of the eye is considered a .... type of adaptat
4. Light sources are ...., ... and ....
5. .... materials that allow most of light to pass through, while .... materials don't allow any light to pass through.
6. The eyes of the nocturnal animals are .... than the human eyes.

3 Match:

(A)	(B)
1. Human skin	a. is a nocturnal animal.
2. A fishing cat	b. diffuse the reflected light rays.
3. Glass	c. is an opaque material.
4. Rough surfaces	d. is a transparent material.

1. .... 2. .... 3. .... 4. ....

4 Put (✓) or (✗):

1. Humans can see in the dark. (
2. The moon is a source of light. (
3. A mirror reflects the light waves regularly. (
4. The thin membrane of nocturnal animals reflects the light waves. (
5. The human eyes shine in the dark. (

5 Correct the underlined words:

1. The moon is the main source of light. (..........
2. The smooth surface reflects the light waves in different directions. (..........
3. A piece of wood is a transparent material. (..........
4. Heat energy is necessary for vision. (..........
5. Birds' eyes are sensitive to light and collect a large amount of light. (..........

6 Write the scientific term for each of the following:

1. It is a little monkey that is about 10 cm long without a tail. (..........)
2. It is the bouncing of light when it falls on a reflecting surface. (..........)
3. The form of the energy that can be seen and helps us to see. (..........)
4. The type of materials that allow most of light waves to pass through. (..........)
5. The type of materials that don't allow any light waves to pass through. (..........)

7 Mention one example of each of the following:

1. Transparent materials. (..........)
2. Opaque materials. (..........)
3. Nocturnal animals. (..........)
4. Smooth surface. (..........)
5. Sources of light. (..........)

8 Give a reason for each of the following:

1. The moon is not a source of light.
....
2. Although the presence of the brain and the sensory organ (Eye), we can't see in the dark.
....
3. The water is a transparent material, while a piece of wood is an opaque material.
....

9 What happens when ...?

1. The cat eyes collect a large amount of light.
....
2. Looking at an object in a very dark room has no source of light.
....
3. The light falls on a rough surface.
....
4. The light falls on a water surface.
....

10 Look at the following figure, then answer:

1. This surface is called a .... surface.
2. The light rays are reflected in a .... direction and with the same angle.



Communication and Information Transfer

Concept Objectives

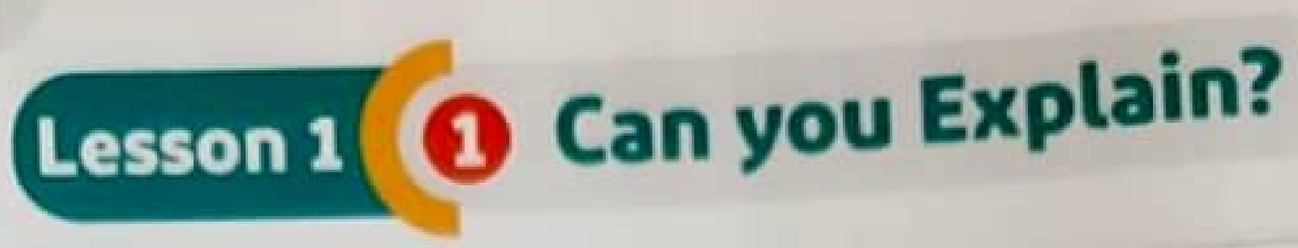
By the end of this concept, the student will able to:

- Generate and compare multiple solutions that use patterns to transfer information.
- Develop a model of a communication system that consists of many parts that work together to transfer information from one place to another.
- Argue from evidence that patterns of light and sound allow for the transfer of information through systems of communication.
- Compare systems of communication in the natural world to innovative designs and devices used in modern human societies.
- Design, test and evaluate models of information-transfer systems that can encode, transmit and receive information.

"Pacing Guide"

Lesson	Activity	Key Terms	Life Skills
WONDER 1	1 Can You Explain? • Students think about and record what they already know about how animals, including humans, use light and other methods to communicate.	Communicate	Students share ideas
	2 Firefly Light Show • Students observe firefly behavior to analyze communication pattern, then ask related questions to be investigated throughout the concept.	Fireflies Chemical reaction	Students ask questions to clarify.
	3 Alphabet and Written Language • Students obtain and evaluate information and identify patterns in each form of communication.	Hieroglyphic writing Cuneiform Language Papyrus paper	Students respect others' ideas
	4 What Do You Already Know About Communication And Information Transfer? • Students reflect on what they already know about how humans and other animals communicate.	Echolocation	———
LEARN 2	5 Song of Whales • Students explore patterns in communication by observing and reading about how whales communicate.	Humpback Whales Pitch	———
	6 Transferring Information • Students analyze text to identify ways that information is transferred using patterns.	Code	Students identify problems.
3	7 Inventing a Code • Students use patterns in light or sound to invent a unique code that they use to transfer information, then identify how their code could be improved.	Encode Decode Morse Code	———
	8 Animals Communicate with movement • Students analyze text to identify ways that information is transferred using patterns, then use patterns in movement to analyze a code in order to transfer information.	Scout bee	Students can apply an idea in a new way.
4	9 Communication Systems • Students explore individual components of systems that humans use to facilitate communication.	Satellite Communication towers Software.	———
	10 How Animals Use Communication System. • Students obtain, evaluate and communicate information about how animals use communication system.	Nurse ants Scout ants Solider ants	Student can respect others
SHARE 5	11 Record Evidence: Firefly Light Show • Students construct an explanation about communication systems are used to transfer information.	———	———
	12 Stem in Action • Students obtain and evaluate information about how animal communication has inspired new technology.	Cane	———
6	13 Review: Communication and Information Transfer • Students summarize their learning and apply it to the big ideas of the unit.	———	———





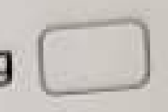
Lesson 1 ① Can you Explain?



Warm-up

- What are the senses that a person uses while watching a football game? (Tick the answer)



Sight and tasting ☐ Sight and hearing ☐


Sight and feeling ☐

How do animals and humans use light, sound and other methods to send and receive information?

- Ears and eyes send sound and light information to the brain through nerves, the brain interprets that information, then sends the response to ears and eyes to help animals and human communicate with the surrounding environment.

Humans use light



Torch



Car lamps



Traffic lights

Some animals use their strong sight sense



Owl



Eagle

Humans use sound to communicate



Television



Radio



Piano

Some animals use their strong hearing sense



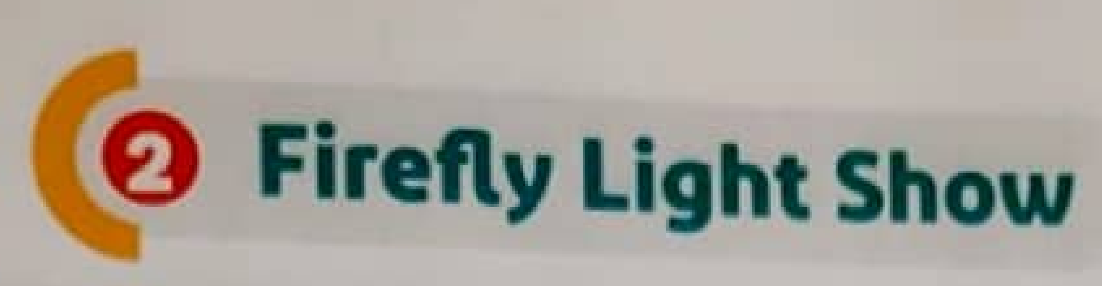
Bat



Dolphin

Parents' Tips:

Help your child learn about communication and how information is transferred using light and sound as well how technology in human communication.



Firefly Light Show

Activity  Ask Questions Like a Scientist



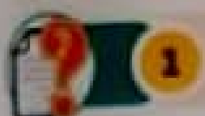
Warm-up

- Have you ever seen a firefly?

Yes ☐ No ☐



- Firefly sets an interesting art show in the mangroves of Thailand.



1 Fireflies are able to light up



- As a result of a chemical reaction which is produced inside their bodies, that allows them to light up.

Fireflies properties:

- Their wings flash to:

Warn off predators **OR** Attract a mate

- They flash at regular periods of time (intervals).
- When there is another firefly flashing nearby, they will interrupt (change) their own pattern and imitate the other firefly pattern.



Conclude Like a Scientist

- **How are senses used by the firefly?**



Answer

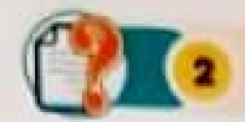
- They use flashing light to warn predators or attract mates.
- They watch other fireflies and match the flashing light patterns.

Parents' Tips:

Help your child consider the behavior of fireflies and how they use light.







2 **Do you think human could influence the fireflies flashing pattern?**

A group of artists imitate fireflies' flashes
by performing the following trial.

Steps	Observation
▸ Using the LED lights to flash light to the fireflies. ▸ They set up lights in the forest to go on and off at regular intervals or in a pattern.	▸ The fireflies respond by flashing back at the same time in large groups.



Conclude Like a Scientist

- **How have humans used light to communicate?**

Answer

- Humans use light signals to communicate in different ways such as:

a. Traffic light
b. The light of the lighthouse signals used to guide the ships





Apply Like a Scientist

(Answer Guide P. 6)

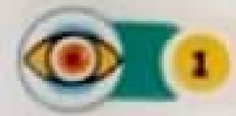
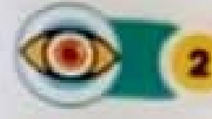
Complete the following sentences using the given words:

light – chemical reaction – communicate

1- The fireflies are able to make light because of the .... that is produced inside their bodies.

2- Humans can communicate by using ....

Activit


Wa
- Do ar
- Peopl
of con

1
to co
2
- Historians

Example

Ancie
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system.
(It is made u
- The oldes
around 30

Parents' Tips:
Help your child rea
time.



3 Alphabet and Written Language

Activity Observe Like a Scientist



Warm-up

- Do animals use writing to communicate? Yes ☐ No ☐
- People use language to communicate by reading, writing and speech these methods of communication separate humans from animals.

1 Communication between people:



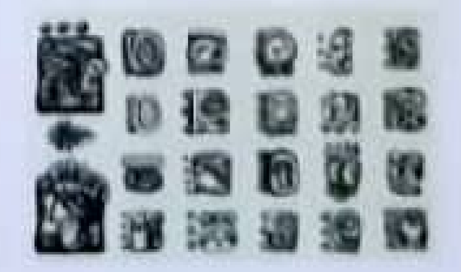
People send messages to communicate with each other.

The language of messages must be understood for both the sender and the receiver.

2 The evolution of writing:

- Historians believe that several cultures developed their own writing system.

Example: Trace evolution in writing of these cultures:

Ancient Egyptians (In Egypt)	Babylonians (In Iraq)	Ancient Mayans people (In Central America)
• They created a hieroglyphic writing system. (It is made up of about 700 symbols) • The oldest writing appeared in Egypt around 3000 BCE.	• They created cuneiform drawing in the year 3000 BCE.	• They created a hieroglyphic writing system. (includes 800 different signs)
		

Parents' Tips:

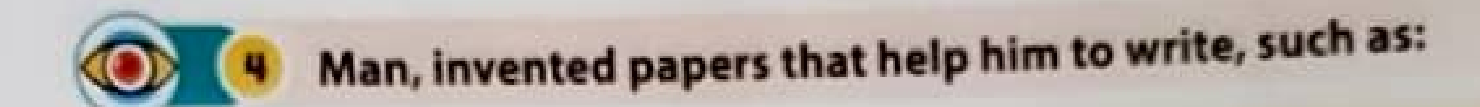
Help your child read about human's early forms of written communication and about communication in different civilizations over time.





3 Writing letters and words:

- At the beginning of the 15th century BCE, many cultures refined and developed a system of writing words using combination of letters, like the letters of the alphabet which developed later.



4 Man, invented papers that help him to write, such as:



1 The Egyptians created papyrus.

It is a kind of paper made from the reed plant that grows in marshes near the Nile River.



2 The Chinese.

In year 105, the Chinese created a form of paper using the inner bark of mulberry and bamboo trees and turned it into a paste from which paper was made.



5 Importance of written language:

A- Makes the communication between people in the present time easy.	B- Helps to understand the past	C- Shares ideas with future civilizations

Apply Like a Scientist *(Answer Guide P. 6)*

Choose the correct answer:

1- The hieroglyphic writing in Egypt consists of .... symbols.

a. 300 b. 700 c. 500

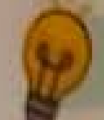
2- .... created a type of paper using the inner bark of bamboo and mulberry trees.

a. Chinese b. Egyptian c. Mayans



Do You Already Know About Communication and Information Transfer?

Activity  **Evaluate Like a Scientist**



Warm-up

Tick the correct answer:





- Use barking to communicate with each other.
  Humans ☐ Animals ☐
- Use car horns to communicate with each other.
  Humans ☐ Animals ☐



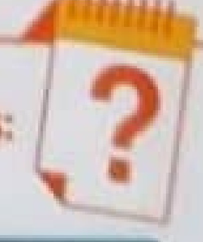


Animals and humans can communicate with their communities using different ways.

Animals	Both	Humans
1. They use echolocation. 2. They secrete odor. 3. They do special movements.	Both produce high pitched sound and display light	They use: 1. Writing 2. Cell phone 3. Electronic reader

Apply Like a Scientist

(Answer Guide P. 6)



Classify the following communication methods into human methods or animal methods:



1- Using traffic lights.



2- Using mobile phone



3- Meowing



4- Hearing echo to get food



5- Writing



6- Using the internet

Human methods	Animal methods

Parents' Tips: ... and how information transfers.

Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 6)

1 Choose the correct answer:

1. Owls and eagles depend on their strong sense of .... to communicate with their environment.

   a. hearing b. sight c. touching

2. People use .... to share ideas with future civilizations.

   a. reading and writing b. flash lights c. waves

2 Complete using the given words:

Bats - Chinese - Babylonians - papyrus - chemical reaction

1. Ancient Egyptians created .... paper from reed plant.
2. Fireflies light up, due to the .... occurs in their bodies.
3. .... use their strong sense of hearing to communicate with their environment.
4. .... people created cuneiform language.

3 "True" or "False":

1. Humans use light to communicate.
2. Chinese people created papers using the inner bark of mulberry and bamboo trees.
3. Dolphins use their touching sense to communicate with their environment.

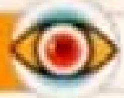




LEARN



Lesson 2 (5) Song of Whales

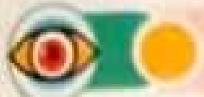
Activity  Observe Like a Scientist



Warm-up

- What senses do you think animals use to communicate (send and receive information)?

☐ Sight ☐ Hearing ☐ Taste ☐ Smell ☐ Touch



How do humpback whales communicate?



- Humpback whales not only produce sounds but they also make music and sing a wide range of notes and a series of phrases pattern in order to communicate.



The humpback whale's songs differ according to the season:

In winter

- Whales sing by high pitched sound (sharp sound) which travels better in cold water.
- It is the mating season.

In summer

- Whales sing by low pitched sound (rough sound) in a warm water.
- It is the feeding season.



Note: Sound Pitch is how rough or sharp a sound is.



Conclude Like a Scientist

- Humpback whales change their songs during seasons.

Answer: Because the temperature of each season affects the sound pitch.

Apply Like a Scientist

(Answer Guide P. 6)

Choose the correct answer:

1. Whales make music in order to ....
   a. communicate b. search for food c. mate d. All the previous answers
2. Humpback whales' songs produced in summer has .... pitched sound.
   a. low b. medium c. high d. No correct answer
3. Humpback whales' songs produced in winter has .... pitched sound.
   a. low b. medium c. high d. No correct answer

Parents' Tips:
Help your child develop what they have learned by exploring how the senses are used to transmit information or communicate.





LEARN

6 Transferring Information

Activity  Analyze Like a Scientist

 ***Warm-up***

- We use our senses to communicate or share information with others.
- Do we use only one sense during communication? Yes ☐ No ☐





1 Sense organs and transferring information:



- Ears → Detect sound energy and send signals to the brain to interpret them.

Example: Hearing the sound of ambulance, means that someone is in danger and on his way to the hospital.

- Eyes → Detect light energy, this means they can detect signals that travel very fast over different distances and send signals to the brain to interpret them.

Example:

Traffic light as seeing red light signals means you have to stop.



Many backcountry hikers carry mirrors to attract the attention of rescue helicopters.



Parents' Tips:

Help your child connect how human senses collect and process information and identify ways humans use their senses to transfer information.



Ancient people used signal fires to communicate over distances of many kilometers



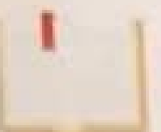
People use flare to get help.





2 Transferring information using codes:

- Humans can transfer information using codes that varies from simple codes to complex ones.



Definition

Code: is a pattern that has meaning.

Examples:



1. Arrangement of letters in a word.



2. Music or sound can be used to communicate messages.



3. Lighthouses encode information in flashes of light that tell sailors where they are.





4 Language is a code in the form of sounds, different languages have different codes, but they all transmit information.



5 Writing is a code that uses symbols.



6 Facial expressions are encrypted signals that help people to know what we think or feel.

- The sense organs receive this information and send message to the brain for decoding, the brain decodes and interprets the meaning.

Apply Like a Scientist

(Answer Guide P. 6)



Complete the following sentences:

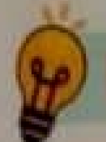
1. .... is a code that uses symbols.
2. .... receive the visual codes such as facial expressions.
3. Flashes that tell sailors with their positions is a kind of ....



Lesson 3 7 Inventing a Code



Activity: Think Like a Scientist



Warm-up

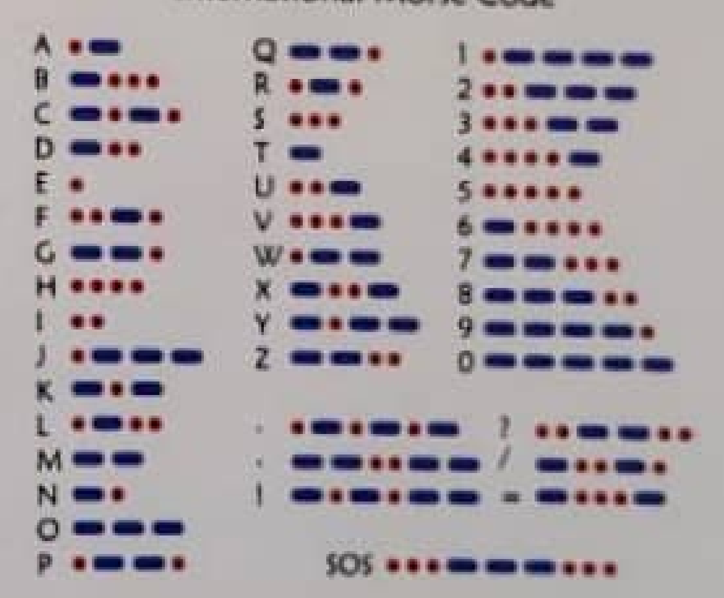
- Can drawings be used as a code to express the letters of the alphabet?

Yes ☐ No ☐

- Human designed code systems using sounds and lights. One such system is called Morse code.



Morse code:



- One of the communication systems that developed by Samuel Morse in the 19th century.
- This code allows people spell words using light patterns (long and short flashes) or sound patterns (long and short beeps).

How do we use it?



- It is a simple code that consists of long and short beeps or flashes, that are converted into dashes and dots.
- Dots and dashes represent the alphabet letters.

Parents' Tips:

Help your child investigate an example of humans using signal to send and receive information.



How do you make a code?

- After you study Morse code, you can create a new code and use it to deal with your partner.

Follow the following steps to make your own code.

Steps:

1. Decide whether you will use flashlight pattern or drum pattern on a table to communicate.
2. In the case of using a flashlight pattern, create a unique signal for every alphabet letter.

Key Code

Number of flashes	The letter	Number of flashes	The letter
One short light	A	Five short lights	I
One long light	B	Five long lights	J
Two short lights	C	Six short lights	K
Two long lights	d	Six long lights	L
Three short lights	E	Seven short lights	M
Three long lights	F	Eight long lights	N
Four short lights	G	Nine short lights	O
Four long lights	H	Nine long lights	P

3. You will send the message using a flashlight and your partner will receive by eyes.
4. The sender writes the message, encrypts it, and sends it.
5. While the recipient receives the encrypted message, then decodes it using the key code.
6. Once the recipient decodes the message, they must contact with each other to check if the sent message is right or not.

Example: What is the required word if you receive the following flash pattern?

(two-short lights - nine- short lights - two- long lights-three short lights)

The word is (....).





Conclude Like a Scientist

1- Was the message arrived from the sender to the receiver correctly or not? If the answer is no, then what went wrong?

Answer

- The message may be sent incorrectly or may be interpreted incorrectly.
- The code may include the same encryption method for more than one letter.

2- What are senses used to receive codes?

Answer

The flashlight code is indicated by sight while the drum code is indicated by hearing.

3- What would we do to improve codes for future use?

Answer

- Simplify codes.
- Make the letter more distinct.

Apply Like a Scientist

(Answer Guide P. 6)

Fill in the blanks:

alphabet letters - information - flashes - Morse code - dashes

1. .... is a simple communication system that developed by Samuel Morse in the 19th century.
2. Morse code that consists of long and short beeps or .... , expressed with dots and ....
3. Codes transfer ....
4. Dots and dashes in Morse code represents .... in a new manner.



LEARN

Lesson 4 (8) Animals Communicate with Movement



Activity: Analyze Like a Scientist



Warm-up

- Human beings may communicate using sound and light, but when your friend waves to you, how does he communicate?

  Using smell sense ☐ Using motion pattern ☐

- Can animals communicate using motion patterns?

  Yes ☐ NO ☐



1 Communication among honeybee:

- Bees in their hives can communicate with each other using motion patterns during search for food and drink resources.



- The scout (dancing) bee moves in a figure-eight pattern with vibrating its wings.



- The movements of the dance tell other bees the direction and distance to the resources.



- The bees in the hive interpret the code and read it, then fly off to the specific location.

Parents' Tips:

Help your child compare animal and human communication systems.

T
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flo

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Ap
Put
1.
2.
3.
4.



Conclude Like a Scientist

1- There are similarities between the human communication ways and the bees.

Answer

Because both use movements to send codes, but bees use codes by performing some movements to express the food direction. While humans use movements to send short messages like "hello and yes".

2- Codes are useful for honeybees who need to communicate to other bees in the hive.

Answer

Because they can't talk like human beings, but they can use motion codes to communicate among themselves.

3- Which sense helps the bees in hive to receive codes from the scout bee?

Answer

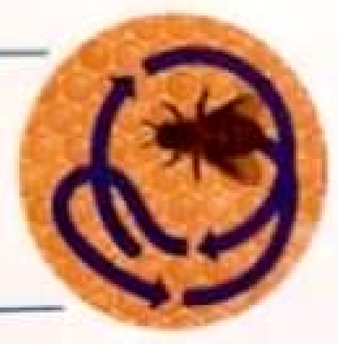
They use sight sense.

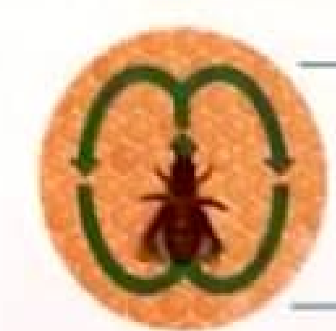


2 Coding with honeybees:

When the bee faces the direction of the flower

The bee does one round dance if the flower is very close.





The bee does a waggle dance if the flower is far away.



Note The bee waggles to the right and then to the left (this is one dance)
One dance = the flower is a little farther away
Three or more dances = the flower is far away

Apply Like a Scientist

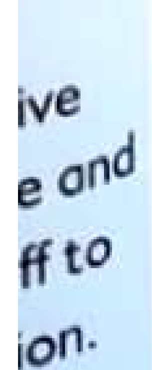
(Answer Guide P. 6)



Put (✓) or (✗):

1. Bees don't use motion codes to communicate. ☐
2. Scout bees fly to find the food and water resources using motion codes. ☐
3. Bees use hearing to encode the scout bees dance. ☐
4. Bees move in the figure of number 8 to guide the other bees in the hive to the predators' location. ☐







LEARN

9 Communication Systems



Activity Analyze Like a Scientist



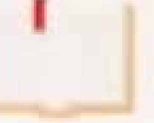
Warm-up

- Which method of communication do you prefer? Letters ☐ Mobile phones ☐



Communication systems:

- Individual messages depend on much larger systems known as communication systems such as the internet, cell phones and cable TV.



Definition

Communication Systems:

- A group of devices that work together to transfer information from one place to another

Communication using the cell phone system:

A cell phone is a part of a system with other parts such as:

Satellites



Communication Towers



Software



- These parts work together to help us to talk to our friends and transfer information.

Apply Like a Scientist

(Answer Guide P. 6)

Complete the following sentences using the given words:

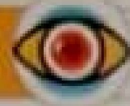
satellite – software – communication system – communication towers – cable TV – internet -cell phone

1. .... is a group of devices that work together to transfer information from one place to another.
2. A mobile phone is a part of a communication system includes ...., ... and .... that work together to enable you to call your friends.
3. ...., ... and .... are examples of the communication system.

Parents' Tips:

Help your child consider the complex communication systems humans have designed.

10 How Animals Use Communication Systems

Activity  Observe Like a Scientist



Warm-up

- What is the communication method used by each of the following animals?

Bees: .... Whales: ....

- Communication between humans has changed a lot since the beginning of sharing information with written symbols, as technological communication systems allow us to:
  - Make phone calls.
  - Send text messages.
  - Sending emails over great distances.
- Animals do not use the technological communication systems as humans, but they can use other communication systems.

How do ants communicate with each other?



- As ants live in colonies composed of thousands of individuals, they have developed systems where groups of ants perform different roles.
- Ants use their sense of smell to communicate in the case of lack of food.

Nurse ants send smelly messages to scout ants if the food is low. → The scout ants respond by sending a smelly message to alert ants to find the food. → The solider ants also use smells to communicate if there is danger nearby.

Apply Like a Scientist

(Answer Guide P. 6)

True or False

1. Ants emit a yellow liquid to alert scout ants when there is a lack of food. ( )
2. Ants use echo to communicate with each other. ( )
3. Ant soldiers emit scents in case of danger. ( )
4. Animals can use technological means of communication. ( )

Parents' Tips:

Help your child compare between the animal communication systems and the human-designed communication systems.



Al-Adwaa Exercises on Learn Activities

(Answer Guide P. 6)

1 Choose the correct answer:

1. .... is/are a type of coding in the form of sounds to transfer information.

   a. Lighthouses   b. Language   c. Long and short whistles

2. In Morse code, words are spelled using sound patterns by ....

   a. Long and short flashes   b. long and short beeps   c. using colors

3. Ants use their sense of .... to communicate.

   a. hearing   b. touching   c. smelling

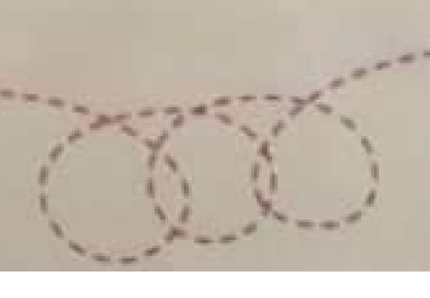
4. .... system is the system responsible for communication between our body organs.

   a. Digestive   b. Nervous   c. Respiratory

2 "True" or "False":

1. The ear collects sound waves, then its nerve sends signals to the brain to translate these waves. (   )
2. Humpback whales change their songs throughout seasons. (   )
3. Drums are used in some communities as a code. (   )
4. Bees in their hives depend on their sense of hearing to receive codes from other bees. (   )
5. Morse code is made of dots and dashes that represent alphabet letters. (   )





3 Complete using the given words:

Code - Facial expressions - close - lighthouses - far away

1. Humans can communicate / or transfer information by using ....
2. .... encode information in the form of flashes to tell the sailors their locations.
3. .... are types of coding that show how the human beings communicate with feels or thinks.
4. One bee waggle means that the flower is .... but 3 waggle dances or more means that the flower is ....

4 Write the scientific term:

1. A pattern that has a meaning. (....................)
2. A group of devices that work together to transfer information from one place to another. (....................)



Lesson 5 (11) Record Evidence: Firefly Light Show

Activity  Record Evidence Like a Scientist

How can you describe a firefly light show now?

- Fireflies use their wings to flash light to warn off predators or attract a mate.
- Their ability to flash light is the result of a chemical reaction that occurs inside their bodies.

Can you explain like a scientist, how do animals including humans, use light, sound and other methods to send and receive information?

Claim:

- Animals and humans use their senses to receive different signals such as light, sounds, movements to communicate.

Evidence:

- Fireflies use patterns of flashing light, whales use song tones and bees use movement to send messages.
- Humans can use patterns of light and sound to send messages, such as Morse Code.

Scientific Explanation

Animals communicate using different methods.



- Bees use a waggle dance to tell others where to find food.



- Ants release scents to guide other ants to find food and warn them of enemies.



- Whales use music tones to find food and mate.

Parents' Tips:

Help your child revise what he/she had learned throughout the concept.



Communication between people:

1 Communicate by light using different methods.. such as:

Traffic lights



Light houses

2 Communicate by sound using different methods .. such as:



Drums



Language

3 Design a technological communication systems .. such as:



Internet



Cable TV



Cell phone

4 Use codes such as Morse code

International Morse Code



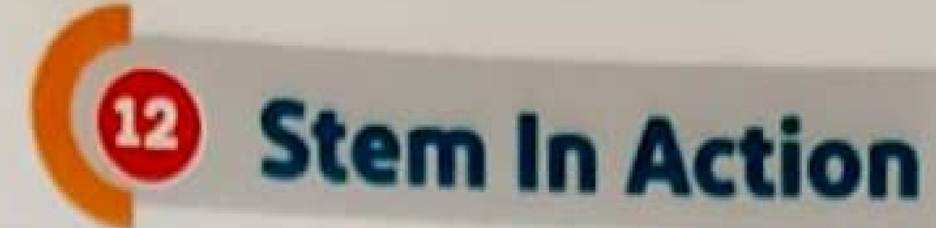
Definition

Communication Systems:

- A group of devices that work together to transfer information from one place to another.







12 Stem In Action

Technology Inspired by Nature

Activity  **Analyze Like a Scientist**



How were scientists inspired by bat echolocation?

Bat uses sounds for different purposes

- To communicate with each other.
- To get information about their surroundings.





Bats use their ears to see in the dark.
How do they do this?

1. Bat makes a high-pitched sound and then listens for an echo (reflected sound).
2. When bat hears the reflected sound, they know that there is something nearby.

Bats use echoes to tell where and how far away objects are.

A Bat-Inspired Cane:

- Adaptations in bats have inspired scientists to help blind people detect their surroundings.
- Scientists created a cane.

How does the blind crutch work?



1. The cane emits a high-pitched sound (which is too high for human to hear).
2. It picks up the echo of these sound waves then the echo turned into vibrations that a person can feel with his thumb.
3. The vibrating buttons tell the person the direction of obstacles and the nearby bodies that surround him.

Parents' Tips:

Help your child connect the scientific ideas of animals communication methods using their senses to realworld applications and make connections between bat echolocation and assistive devices for blind humans.

Echolocation on cane and at the bat:

Similarities	Differences
• The cane and bats emit a high-pitched sound that bounces off objects with an echo, the cane and bats, then hear the echo and can tell how far away objects are.	• The cane picks up an echo from the sound it emits and changes it into a vibration that the person using the cane feels and it tells them also where objects are around them. Bats don't change the echo into vibrations.



Conclude Like a Scientist

- **Think back to how honeybees communicate with each other. How are the cane and the honeybee's dance similar?**



Answer

Honeybees make a series of movements and vibrations with their wings to communicate flower location to other bees. The cane makes a series of vibrations to communicate to the person using it where objects around them are located.



- Research about echolocation in the following fields.



1 Science

- The types of waves that bats emit during flight and their most important use in medicine and industry.



2 Technology

- Calculate the speed of sound waves in the air.



3 Engineering

- The development of the cane industry for the blind and its reliance waves and remote sensing to provide an easier life for the blind.

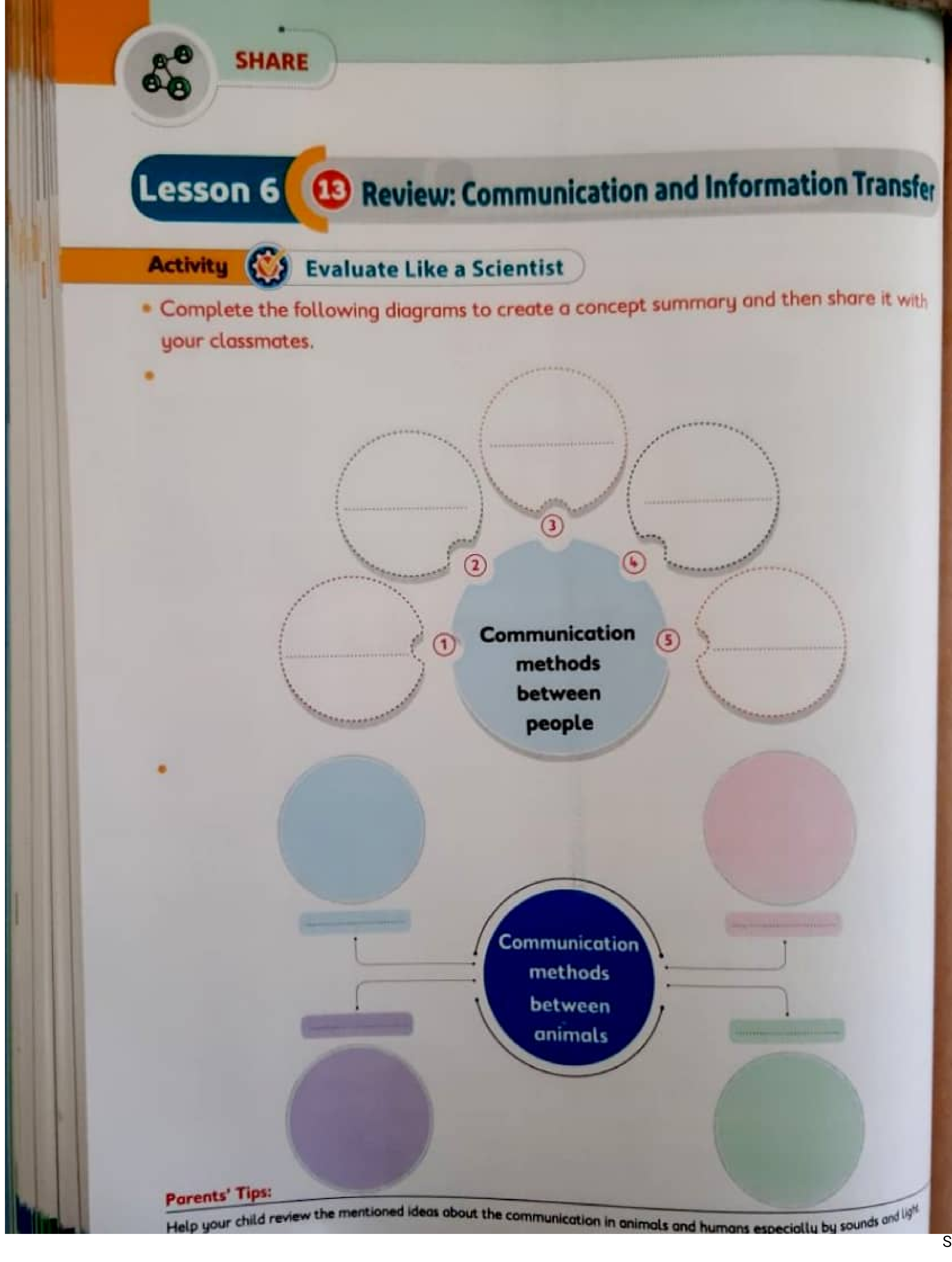


4 Mathematics

- Properties of three-dimensional geometric shapes, such as the cylindrical shape of the cane and the making of models for it.







SHARE

Lesson 6 (13) Review: Communication and Information Transfer

Activity: Evaluate Like a Scientist

- Complete the following diagrams to create a concept summary and then share it with your classmates.

- Communication methods between people

(1) ....
(2) ....
(3) ....
(4) ....
(5) ....

- Communication methods between animals

....
....
....
....

Parents' Tips:
Help your child review the mentioned ideas about the communication in animals and humans especially by sounds and light

Al-A...
Exercis...

1 Choos...

1. ... in... a.
2. ... de... a.
3. Th... a.
4. Th... a.
5. Th... a.
6. On... a.
7. Mor... a. S
8. Bee... a. li
9. The c... a. m

Exercises on Concept 4 (Answer Guide P. 7)

1 Choose the correct answer:

1. .... are from the animals that depend on the sight sense to collect information and communicate with the environment.
   a. Bats b. Owls c. Snakes d. Dogs
2. .... is/are from the tools that the humans use to collect information which depends on the light.
   a. Radio b. Car's lamps c. Piano d. Guitar
3. The hieroglyphic writing in Egypt consists of .... symbols.
   a. 300 b. 700 c. 500 d. 1000
4. The alphabet has evolved from the beginning of the .... century.
   a. 13 b. 10 c. 15 d. 19
5. The lighthouses were used in the past, depending on the sense of ....
   a. sight b. hearing c. touching d. smelling
6. One of the common ways of communication between humans and animals is the ....
   a. mobile phone b. TV c. flashing light d. Internet
7. Morse code developed by ....
   a. Samuel Morse b. Newton c. Edison d. Alfred
8. Bees communicate depending on ....
   a. light b. sound c. movements d. internet
9. The communication between ants occur by ....
   a. movement b. light c. smell d. sound

2 Complete the following sentences:

1. In the year 3000 BC, ... created a writing system called cuneiform writing
2. Humpback whales make sounds in the form of a .... to communicate between them.
3. The bee moves around itself in the form of number .... with its wings vibrating to tell the rest of the bees about the location of ....
4. Among the examples of communication systems between people are .... and ....

3 Choose from column (A) what is suitable for column (B):

(A)	(B)
1. Can read the human facial expressions	a. fireflies
2. From the examples of communication system	b. ants
3. They can communicate with each other by sending smell messages	c. dogs
4. Use wings to attract a mate	d. cell phone

1. .... 2. .... 3. .... 4. ....

4 Put (✓) in front of the right statement and (X) in front of the wrong one:

1. Humans cannot immitate the fireflies flash pattern. ( )
2. Whales sing in the winter for the feeding season. ( )
3. Facial expressions are considered codes used to express what we are thinking about. ( )
4. Ants depend on the sense of touch to communicate. ( )
5. The way of communication that distinguishes man from animals is light. ( )

5 Correct the underlined words:

1. Fireflies light up at irregular periods of time. (..........)
2. The cell phone is a part of the nervous system. (..........)
3. Codes are not useful to bees. (..........)

6 Write the scientific term for each of the following:

1. Insects that emit light. (..................)
2. Pattern that has a meaning. (..................)
3. A group of devices that work together to transfer information from one place to another. (..................)

7 Mention one example of each of the following:

1. An animal that communicates through movement and dance. (..................)
2. An animal that communicates by smelling. (..................)
3. Code based on light flashes and sound beeps. (..................)
4. Animals that light up in order to be able to communicate. (..................)

8 What happens when...?

1. The fireflies cannot light up.

....

2. The scout bees do not make its specific dance.

....

3. There ants cannot send smell messages.

....

4. There are no lighthouses in the port of ships.

....

5. There are no traffic lights.

....

9 Give a reason for each of the following:

1. Fireflies can light up.

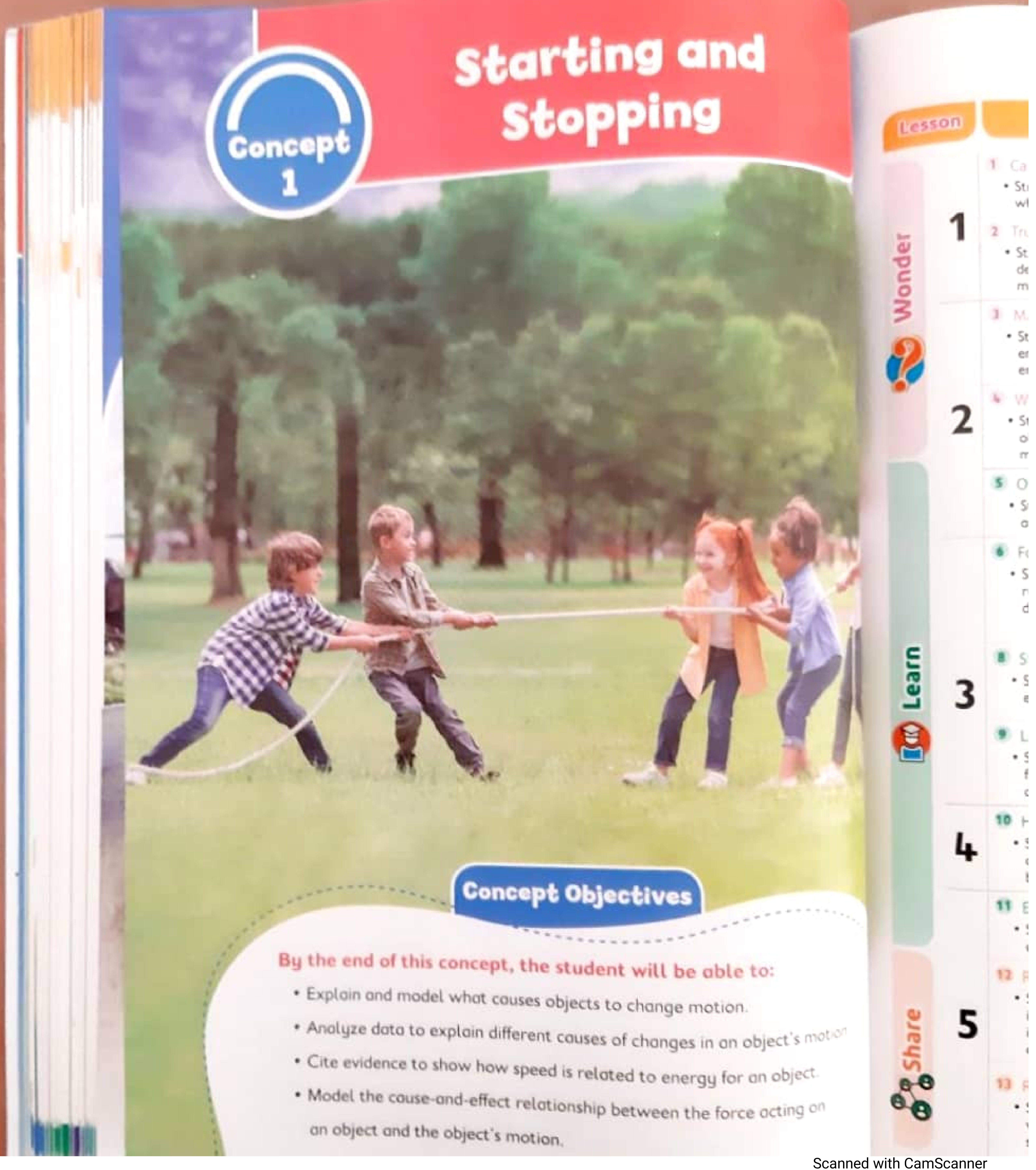
....

2. Communication between humans is now much easier than communication in the past.

....

3. Whale's songs change according to the season.

....



Concept 1 Starting and Stopping

Concept Objectives

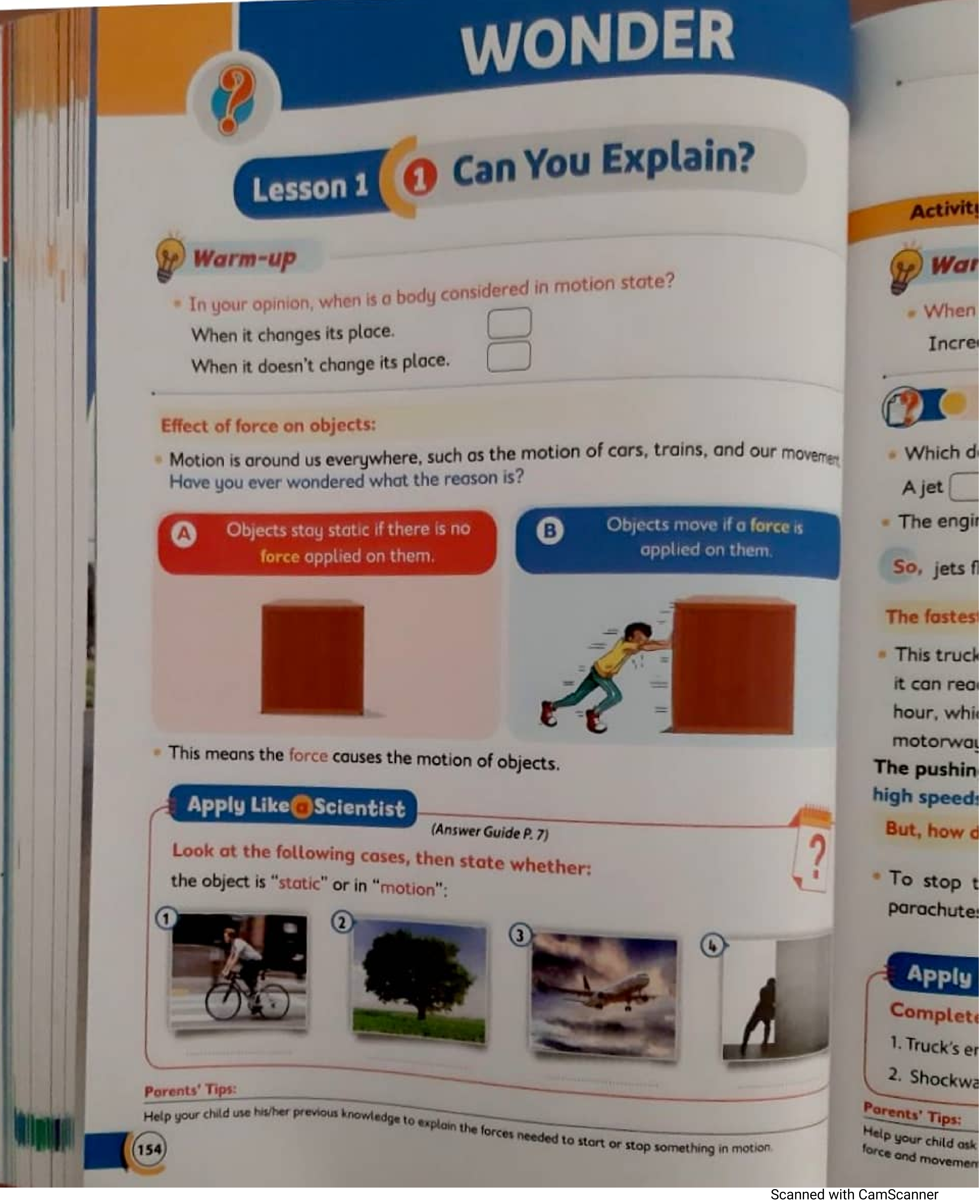
By the end of this concept, the student will be able to:

- Explain and model what causes objects to change motion.
- Analyze data to explain different causes of changes in an object's motion
- Cite evidence to show how speed is related to energy for an object.
- Model the cause-and-effect relationship between the force acting on an object and the object's motion.

"Pacing Guide"

Lesson	Activity	Key Terms	Life Skills
1	**1 Can You Explain?** • Students use prior experience to construct an explanation of what forces are necessary to start a car moving.	——	Students can share ideas they are not yet sure about.
	2 Truck versus Airplane • Students will read a text about a truck racing an airplane and develop questions about the relationship between force and movement or speed.	——	Students can ask questions to clarify.
2	**3 Making Things Move** • Students explore the cause-and-effect relationship between energy and motion and construct an explanation about how energy can be transferred between objects.	- Motion - Force	Students can ask questions to clarify.
	4 What Do You Already Know About Starting and Stopping? • Students consider the various factors that characterize an object's motion based on what they already know about motion and change.	——	——
3	**5 Objects in Motion** • Students focus on the indicators that define an object's motion and the types of force that cause motion.	- Gravity	Students can analyze a situation.
	6 Force • Students engage in a discussion about the cause-and-effect relationship between push and pull forces and motion in their daily lives.	——	Students can identify problems.
	8 Stopping Motion • Students analyze a text about stopping motion to predict the effect of energy changes caused by collisions.	- Friction	Students can use information to solve a problem.
	9 Launching a Satellite • Students apply their understanding of balanced and unbalanced forces to construct an explanation about how forces acting on a space.	——	Students can review their progress towards a goal.
4	**10 Hands-On Investigation: Rolling Cars** • Students collect and analyze data about the distance model cars travel to construct an explanation about the relationship between force and energy in different scenarios.	——	——
5	**11 Energy, Work, and Force** • Students give an explanation of the relationship between force and energy in the context of work.	- Energy - Work	Students can respect others.
	12 Record Evidence: Truck versus Airplane • Students review and discuss their initial explanations about the investigative phenomenon Truck versus Airplane, based on the information about forces and motion acquired in the previous activities.	——	Students can apply an idea in a new way.
	13 Review: Starting and Stopping • Students summarize their learning about starting and stopping with a written explanation and by completing a concept summative assessment.	——	——

Wonder
Learn
Share



WONDER

Lesson 1 ① Can You Explain?

Warm-up

- In your opinion, when is a body considered in motion state?

When it changes its place. ☐

When it doesn't change its place. ☐

Effect of force on objects:

- Motion is around us everywhere, such as the motion of cars, trains, and our movement. Have you ever wondered what the reason is?

Ⓐ Objects stay static if there is no **force** applied on them.

Ⓑ Objects move if a **force** is applied on them.

- This means the **force** causes the motion of objects.

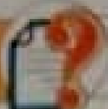
Apply Like a Scientist

(Answer Guide P. 7)

Look at the following cases, then state whether:
the object is "static" or in "motion":

① ② ③ ④

Parents' Tips:
Help your child use his/her previous knowledge to explain the forces needed to start or stop something in motion.



Truck versus Airplane



Activity — Ask Questions Like a Scientist



Warm-up

- When you ride your bike, what do you do if you want to stop it?

Increase pushing the pedals. ☐ Press the brakes. ☐

Truck versus Airplane

- Which do you think is moving faster?

A jet ☐ A truck ☐

- The engines in a jet are much more powerful than the engines in trucks.

So, jets fly much faster than a truck moves.



The fastest world truck "Shockwave":

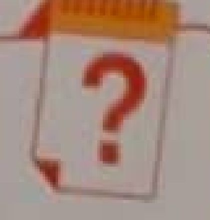
- This truck is fitted with three jet engines, it can reach speeds of more than 500 kilometers per hour, which is five times faster than trucks going on the motorway.

The pushing force of the powerful engines help this truck start moving and record high speeds.



But, how does it stop?

- To stop this truck, truck's engineers installed three parachutes that help slow down the truck speed quickly.



Apply Like a Scientist

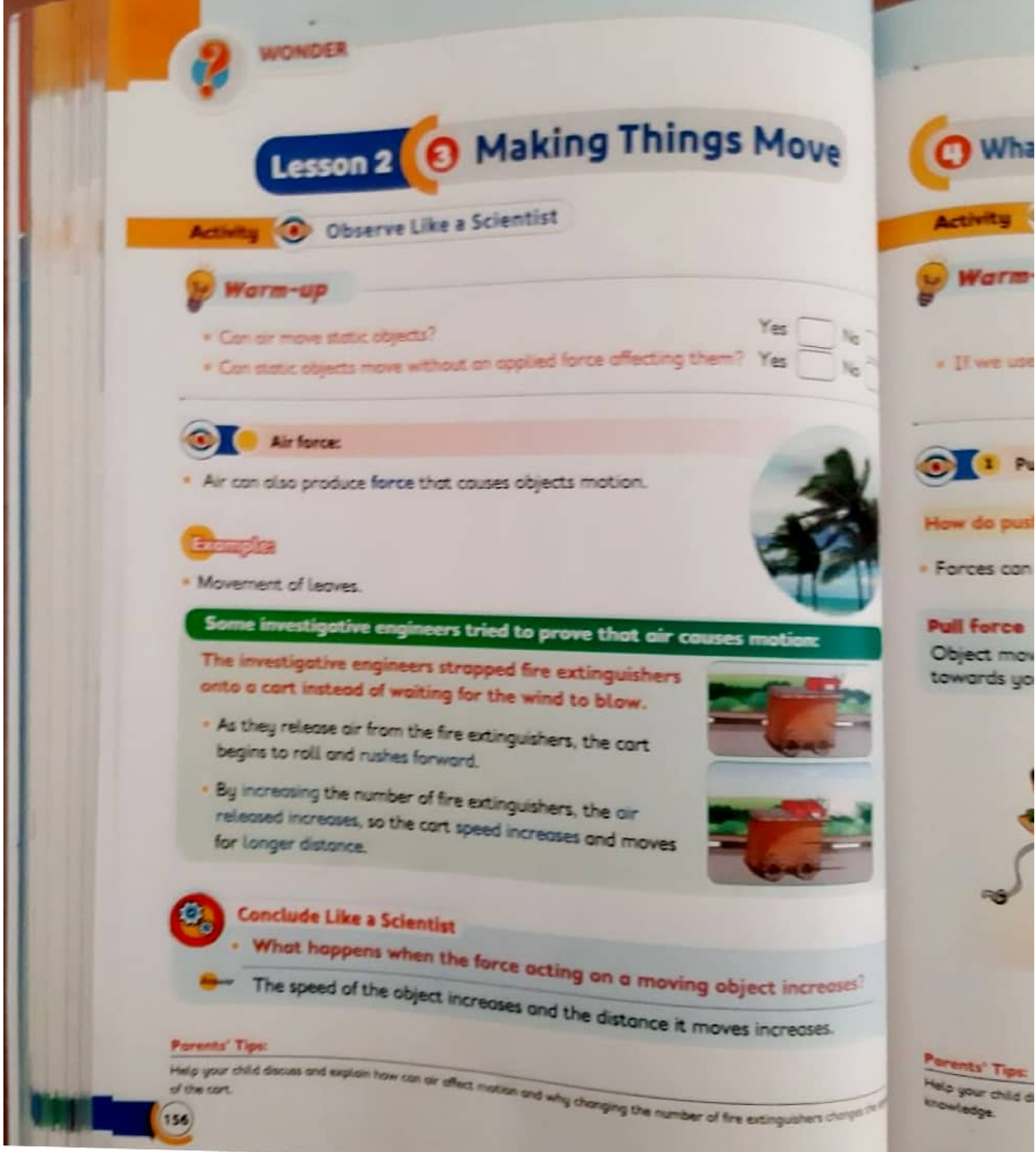
(Answer Guide P. 7)

Complete the following:

1. Truck's engineers installed parachutes to shockwave truck to .... its speed.
2. Shockwave is the fastest truck as it is fitted with three ....

Parents' Tips:

Help your child ask questions about the role of force in stopping a fast-moving vehicle and understand the relationship between force and movement or speed.



WONDER

Lesson 2 ③ Making Things Move

Activity — Observe Like a Scientist

Warm-up

- Can air move static objects? Yes ☐ No ☐
- Can static objects move without an applied force affecting them? Yes ☐ No ☐

Air force:

- Air can also produce **force** that causes objects motion.

Example

- Movement of leaves.

Some investigative engineers tried to prove that air causes motion:

The investigative engineers strapped fire extinguishers onto a cart instead of waiting for the wind to blow.

- As they release air from the fire extinguishers, the cart begins to roll and rushes forward.
- By increasing the number of fire extinguishers, the air released increases, so the cart speed increases and moves for longer distance.

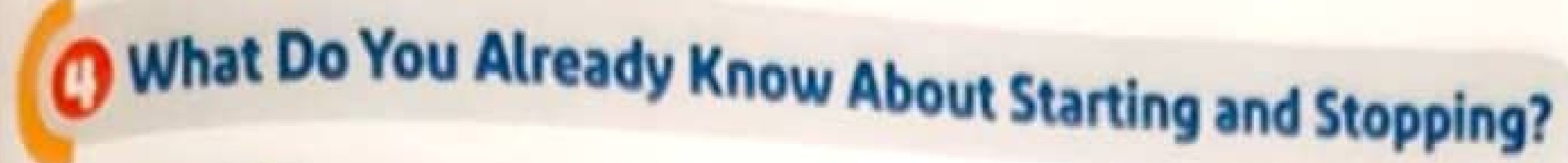
Conclude Like a Scientist

- **What happens when the force acting on a moving object increases?**

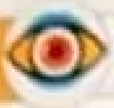
Answer: The speed of the object increases and the distance it moves increases.

Parents' Tips:

Help your child discuss and explain how can air affect motion and why changing the number of fire extinguishers changes the ... of the cart.



4 What Do You Already Know About Starting and Stopping?



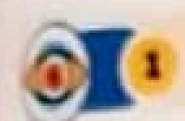
Activity — Observe Like a Scientist



Warm-up

- If we use more force to push something, it will move ____________





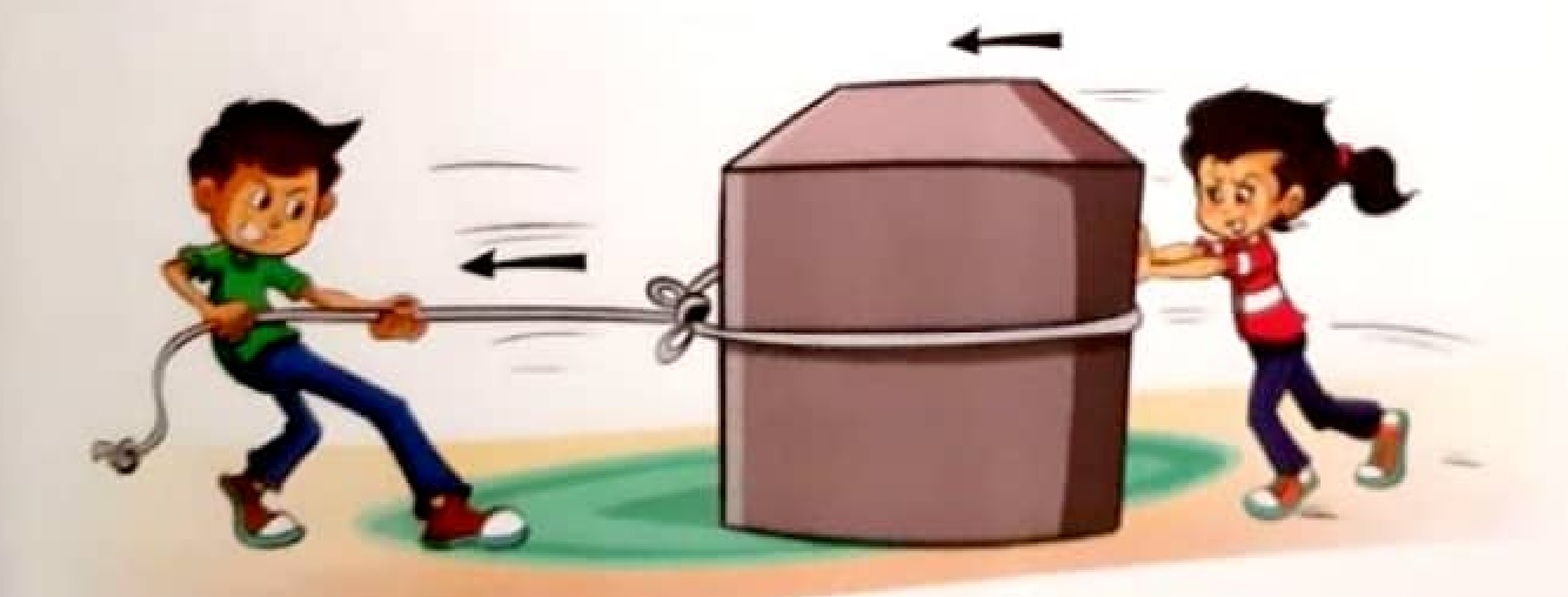
1 Pull and push

How do pushing and pulling forces affect object's motion?

- Forces can make things move, change their speed, or even change their direction.

Pull force
Object moves towards you.

Push force
Object moves away from you.



Parents' Tips:
Help your child distinguish the two ways of forces are applied to objects that affects the motion of objects based on his/her prior knowledge.



WONDER

2 Balanced and unbalanced forces:

- When we push or pull an object, it always moves in the direction of a force applied to it.
- But if several forces are acting on an object, the direction of motion is determined by the sum of all the forces.

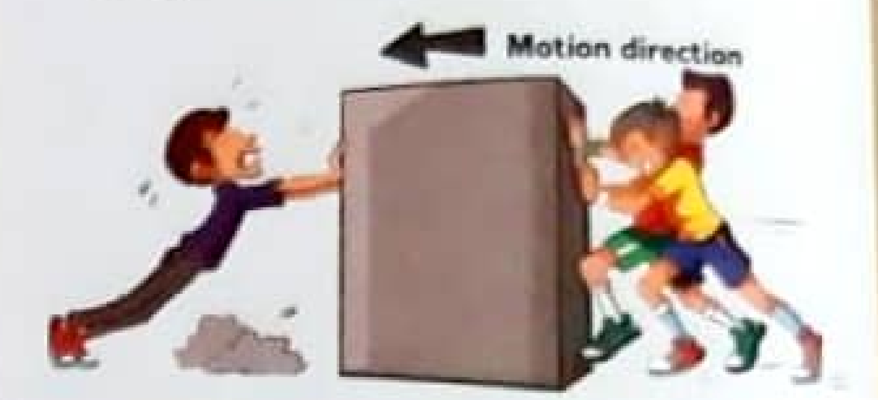
(A) Balanced forces:

- If the forces acting on the object are balanced (equal) and are in the opposite direction, it does not move from its position.



(B) Unbalanced forces

- If unbalanced forces (unequal) act on the object, it moves in the direction of the greater one.



Apply Like a Scientist

(Answer Guide P. 7)



- Look, then complete by using the given words:

(greater - balanced - smaller - unbalanced)



1. If the two groups pull the rope with the same amount of force. In this case, the forces are ....
2. If the rope is pulled towards the boys' group, so their pulling force is .... than the girls' group.



Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 7)

1 Choose the correct answer:

1. The trucks engines are .... airplanes.
   a. less powerful than   b. as powerful as   c. more powerful than
2. By increasing the number of fire extinguishers, the air comes out increases, so the vehicle speed ....
   a. increases   b. decreases   c. remains constant

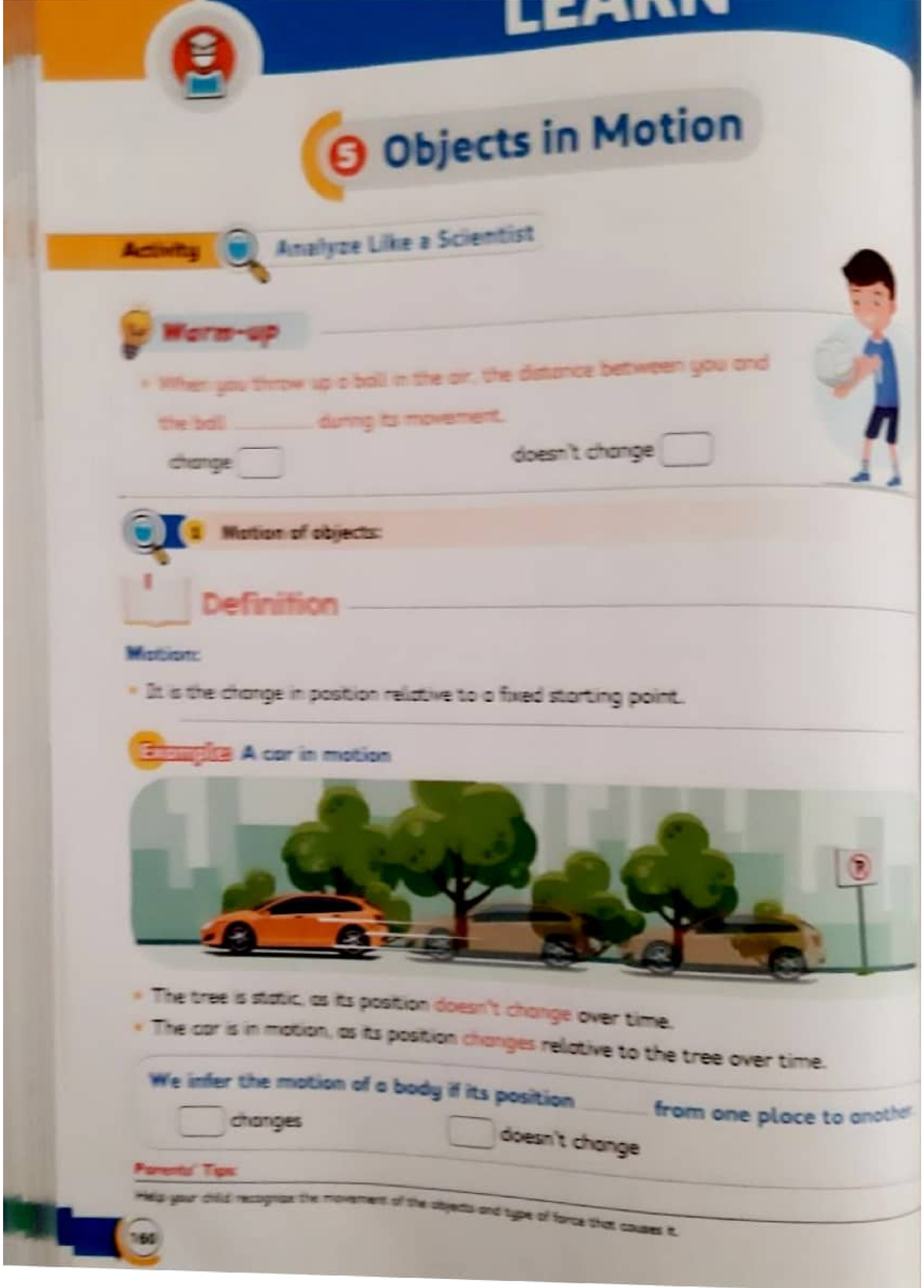
2 Complete using the given words:

(force - equal - unequal - decrease)

1. Objects move when a .... affects them.
2. The object tends to move, if the applied forces are ....
3. Automotive engineers installed parachutes to shockwave truck to .... its speed.
4. Balanced force, is when the number of forces applied on two opposite sides of an object are ....

3 "True" or "False":

1. When the air comes out of the fire extinguisher from behind, the vehicle rushes forward. (..................)
2. Trucks move due to the pulling force done by their engines. (..................)
3. Push and pull are forces that affect the movement of objects. (..................)
4. A body remains in a state of rest unless a force acts on it. (..................)
5. Air can also produce force that causes objects to move. (..................)



5 Objects in Motion

Activity Analyze Like a Scientist

Warm-up

- When you throw up a ball in the air, the distance between you and the ball ______ during its movement.

change ☐ doesn't change ☐

1 Motion of objects:

Definition

Motion:

- It is the change in position relative to a fixed starting point.

Example: A car in motion

- The tree is static, as its position doesn't change over time.
- The car is in motion, as its position changes relative to the tree over time.

We infer the motion of a body if its position ______ from one place to another.

☐ changes ☐ doesn't change

Parents' Tips:

Help your child recognize the movement of the objects and type of force that causes it.



2 Factors affecting motion:

- To move or stop an object, there must be a force of (Push or Pull) applied on it.

Examples:

Moving Object



- Force can be used to move an object, like riding bike.

Stopping Object

- Force can be used to stop an object, like stopping a moving ball.

Things must occur to move an object:

1. A force must act upon the object.
2. The position of the object must change.

Everything around us is in motion state. Are the motion of objects visible to us?
No, some examples of motion are easy to see, and some are not.
Such as , it is easy to see a person walking down the street and a leaf blowing in the wind.

- In addition to forces applied by humans (**Push or Pull**), there are several natural forces like the force that pulls objects downward called **Gravity** force.

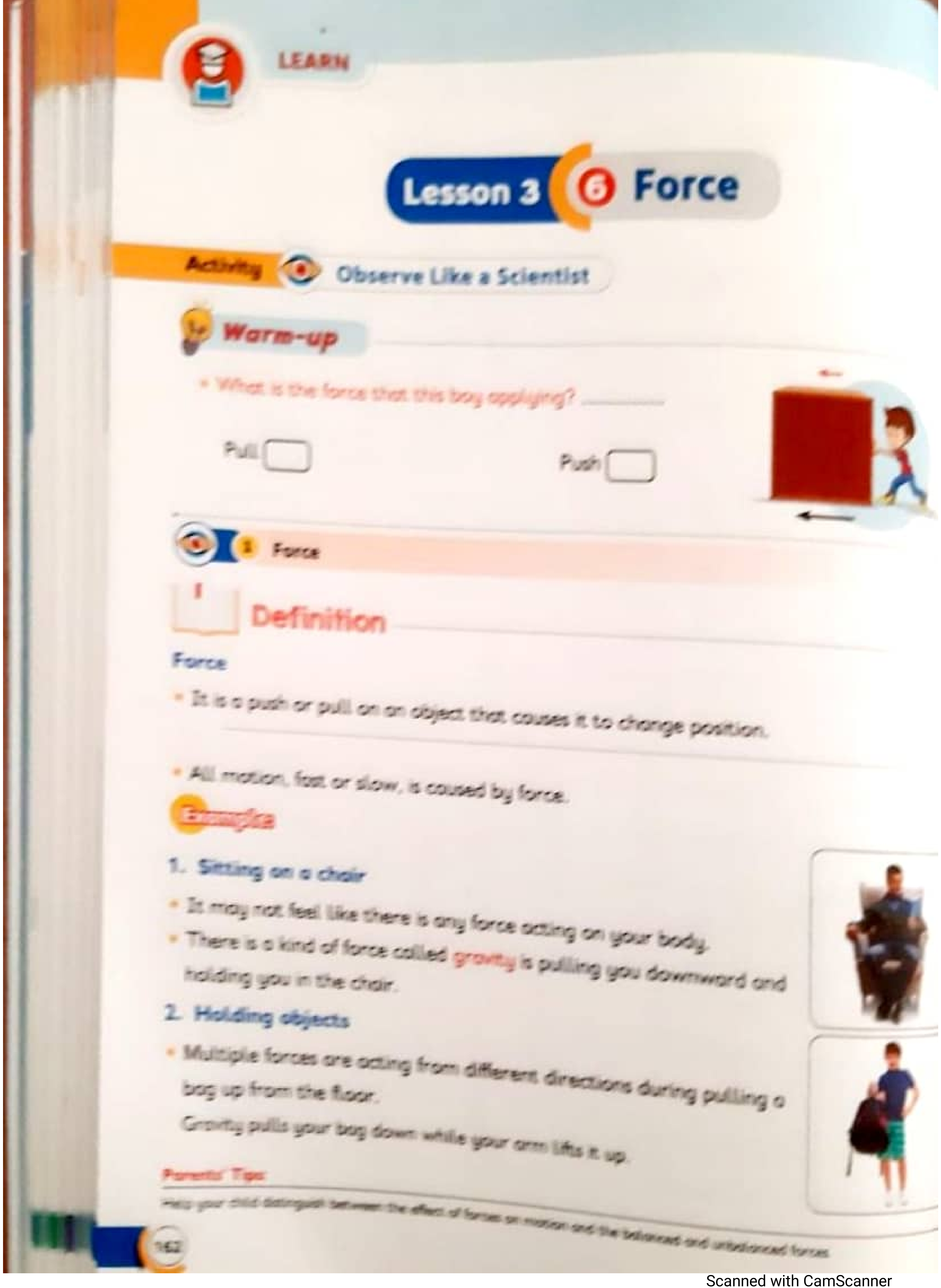
Apply Like a Scientist

(Answer Guide P. 7)



Classify the following examples into "Push" or" Pull":

1. Stopping the ball by the goalkeeper. (..........)
2. Falling of the pen towards the ground. (..........)
3. Inserting a plug into a socket. (..........)
4. Picking up a glass of water. (..........)



LEARN

Lesson 3 6 Force

Activity Observe Like a Scientist

Warm-up

* What is the force that this boy applying? ________

Pull ☐ Push ☐

1 Force

Definition

Force

* It is a push or pull on an object that causes it to change position.

* All motion, fast or slow, is caused by force.

Example

1. Sitting on a chair

* It may not feel like there is any force acting on your body.
* There is a kind of force called gravity is pulling you downward and holding you in the chair.

2. Holding objects

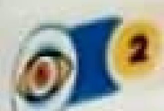
* Multiple forces are acting from different directions during pulling a bag up from the floor.

Gravity pulls your bag down while your arm lifts it up.

Parents' Tips:

Help your child distinguish between the effect of forces on motion and the balanced and unbalanced forces.





2 Forces affect objects' motion:

- The world around us is in constant motion and there are two forces affecting motion which are the push and pull forces.



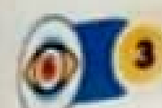
Examples of starting or stopping motion using pushing force:

- Vendors push carts through busy markets.
- Playing football games.



Examples of starting or stopping motion using pulling force:

- Pulling your bag upwards.
- Things fall down due to gravity.



3 Tug-of-war:

- A key part of understanding motion and force is to recognize balanced and unbalanced forces.

During a tug-of-war game:

- When the forces are balanced at the two ends of the rope, neither team moves forward.
- When the forces are unbalanced at the two ends of the rope, the rope moves towards the greater force.



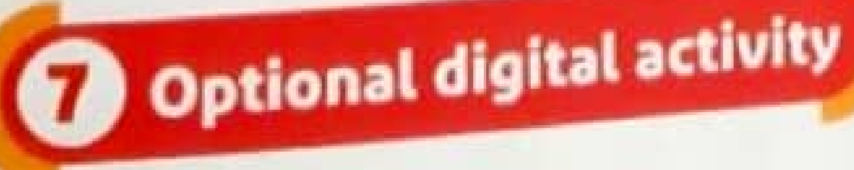
Balanced Force



Unbalanced Force

So,

Cause	Effect
Balanced forces applied on a static object.	The object will not move.
Unbalanced forces applied on a static object.	The object tends to move.



7 Optional digital activity

Tug-of-War

- To know more information about the balanced and unbalanced forces applied during playing the tug-of-war game, use the Egyptian Knowledge Bank.



https://study.ekb.eg/



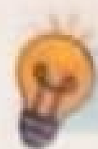


LEARN



8 Stopping Motion

Activity  **Analyze Like a Scientist**

 ***Warm-up***



- If you know that the forces acting on the box from both sides are equal.

  Will the box move? ....



1 Stopping motion:

- Moving objects only stop when a force of the same size (magnitude) is applied to them in the opposite direction from which they are moving. (Balanced Force)

Look at the following picture, then answer:



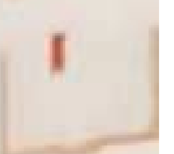
- When a moving car crashes into a wall, ...
  - the car stops
  - the speed of the car increases

Explanation:

- When the car crashes into a wall, it stops moving because the wall applied a force to the car equal to the amount of the car's pushing force, which acts in the opposite direction of its motion, so it stops.

Parents' Tips:

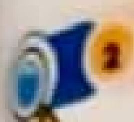
Help your child analyze situations about the stopping motion of objects.









2 Friction Force:

There is a kind of force called friction affecting the motion of objects and decreases their speed.

Definition

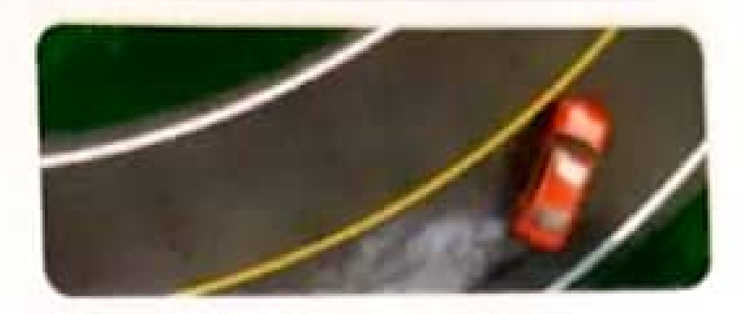
Friction Force:

- It is the force that exists between two touching surfaces and its effect is in the opposite direction of the movement.
- It is the force that opposes the motion of an object.



Example:

Speeding car moves on highway road.



Explanation:

- The car is moving forward in the same direction of pushing force.
- There is a friction force arises between the tires of the car and the ground when you lift your feet up from the gas pedals, friction increases, so the speed of the car slows down, until it stops.

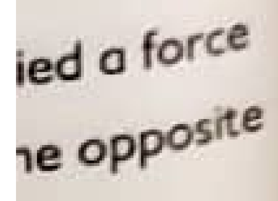
Challenge:

Try to move a toy car across different surfaces, such as a ceramic floor or grass. In your opinion, on which surface, the car will be able to travel a longer distance?

Apply Like a Scientist *(Answer Guide P. 7)*

Complete the following:

1. The friction force acts in .... direction of the motion.
2. .... force opposes moving objects.
3. The magnitude of the pushing force of a car when it crashes into a wall is .... to the magnitude of the force wall, so the car stops its moving.

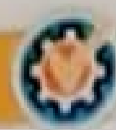


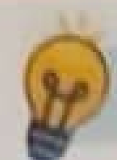




9 Launching a Satellite



Activity  **Evaluate Like a Scientist**



Warm-up

- The forces in this picture are ....

balanced ☐ unbalanced ☐



Launching a Satellite

- The world is currently busy in the field of space exploration, and to be able to discover it they send many satellites using rockets.

How do balanced, unbalanced and friction forces affect a satellite launching?

- Before launch, the rocket stands motionless on its launch pad because the forces acting on the rocket are balanced forces.
- During launching, the rocket begins to move and gets away from Earth because the forces acting on the rocket are unbalanced forces.
- Once the rocket is in space, it can release the satellite into orbit.



Note There is no air (no friction) in space, so the satellite can keep traveling at the same speed for hundreds of years.

Apply Like a Scientist

(Answer Guide P. 7)

Choose the correct answer:

1. There is no air in space so, there will be no (gravity / friction) to slow down the satellite.
2. The rocket remains stationary at the start of lunching because of the (balanced / unbalanced) forces applied on it.
3. The rocket moves and can get out of the planet, due to the (balanced / unbalanced) forces applied on it.

Parents' Tips:

Help your child understand the effect of balanced and unbalanced forces acting on ...



Lesson 4 (10) Hands-On Investigation: Rolling Cars

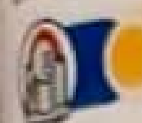


Activity: Investigate Like a Scientist

Warm-up

- If you push a tennis ball and football with the same force.
- Which one do you think travels longer distances?

Tennis ball ☐ Football ☐



The Relation between the force and energy:

Activity

Aim:- Identify the relation between the force and energy:

Materials: Toy car – Measuring tape

Steps	Illustration
1. Push the toy car hard, then record the distance it rolls using the tape. 2. Repeat the previous step several times then calculate the average distance.	
3. Gently push the car, then record the distance it moved using the tape. 4. Repeat the previous step several times then calculate the average distance.	

Observation:

When we push an object "toy car" hard, it moves faster and travels a longer distance.

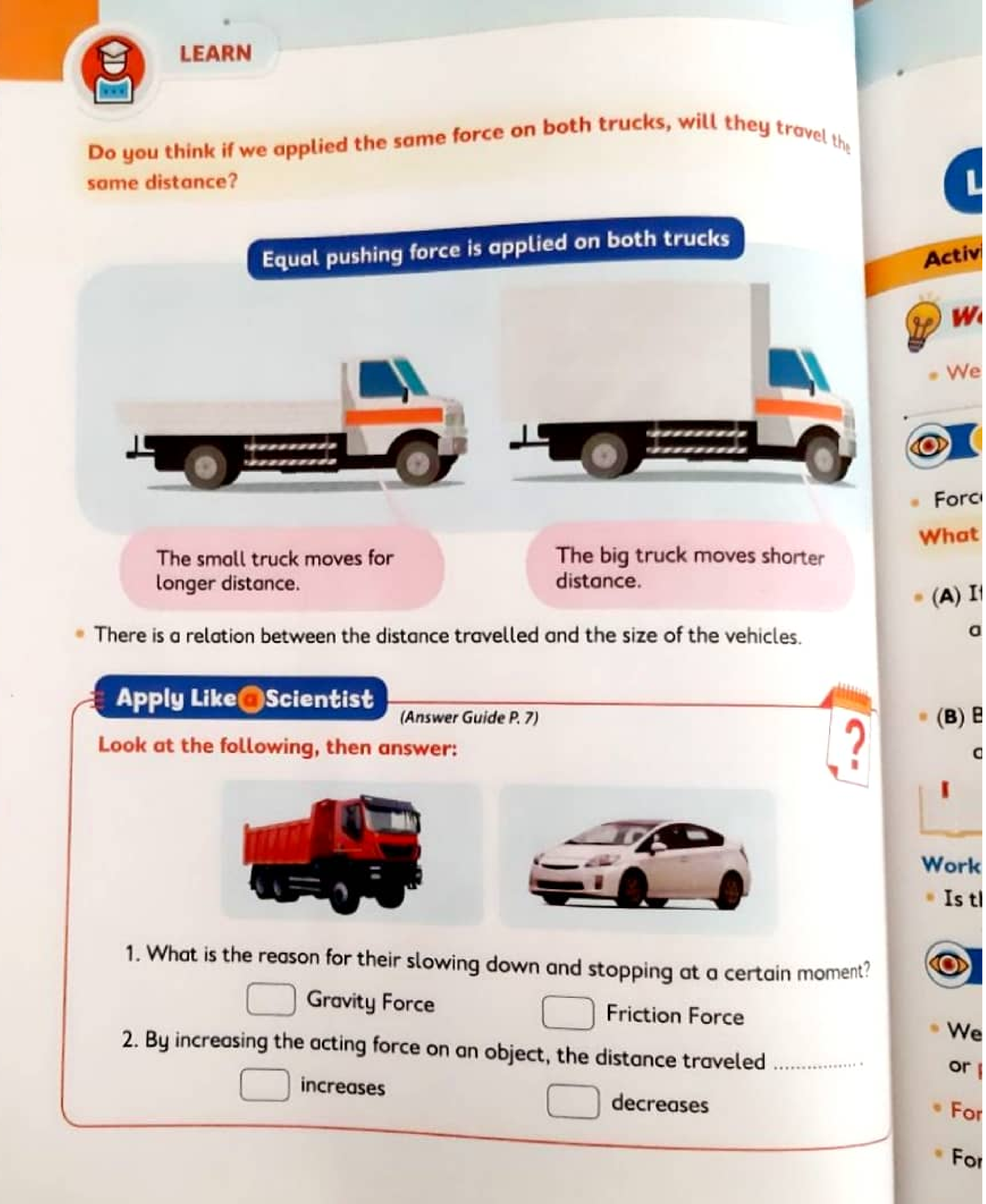
Conclusion:

By increasing the acting force on an object, the kinetic energy will increase, and therefore the distance traveled increases.

Parents' Tips:

... travel to provide evidence for the relationship between force and energy.





LEARN

Do you think if we applied the same force on both trucks, will they travel the same distance?

- There is a relation between the distance travelled and the size of the vehicles.

Apply Like a Scientist

(Answer Guide P. 7)

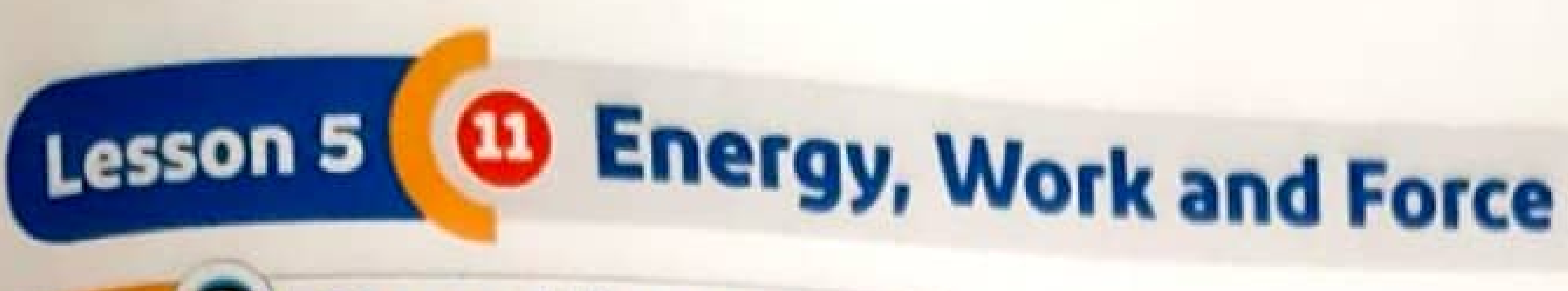
Look at the following, then answer:

1. What is the reason for their slowing down and stopping at a certain moment?

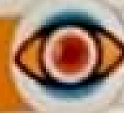
   ☐ Gravity Force ☐ Friction Force

2. By increasing the acting force on an object, the distance traveled ....

   ☐ increases ☐ decreases



Lesson 5 11 Energy, Work and Force

Activity Observe Like a Scientist



Warm-up

- We can't see forces, but we can see or feel what they can do. Yes ☐ No ☐

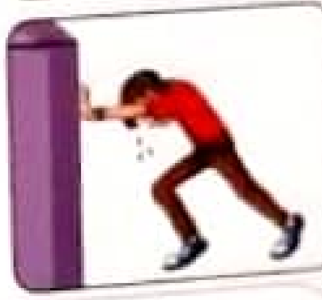
1 Work

- Force transfers energy from one object to another.

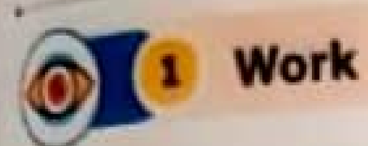
What is work?



- (A) If a force is exerted on an object and it moves a distance, as riding a bicycle, there is work done.



- (B) But if a force is exerted on an object and it doesn't move a distance, as a pushing wall, there is no work done.



Definition

Work:

- Is the energy transferred by a force that is used to move an object.

2 The Relation between Force, Energy and Work:

- We have studied before if we need to start or stop a moving object, we must apply pull or push force.
- Force and energy are different, but they are related to one another.
- Force transfers energy from one object to another, so it can do work.

...n force and energy in the context of work.







Energy:

- It is the ability to do work.

Example: Pushing a car



- The boy needs a large amount of energy stored in his body from eating food.
- This energy enables him to push the car away.
- And when the car moves a distance, we say that the boy has done work.

Energy → Gives Us → Force → Enables Us to do → Work

Apply Like a Scientist

(Answer Guide P. 7)

Look, then choose the correct answer:



1. If the man has enough (energy - work), he can move the box by applying a (work - force).
2. If the box moves, it means that he has (work - energy) done.

Al-Adwaa Exercises

on Learn Activities

(Answer Guide P. 7)

1 Choose the correct answer:

1. When you push the pedals of the bicycle, you will ....
   a. move in the same direction
   b. move in the opposite direction
   c. not move

2. An object stops moving when friction force between the two touching surfaces ....
   a. increases
   b. decreases
   c. No correct answer

3. The force needed to kick a big ball .... the force needed to kick a small ball.
   a. is larger than
   b. is less than
   c. equals

4. The friction force between two touching surfaces, its effect acts in the .... direction of the moving body.
   a. opposite
   b. same
   c. No correct answer

2 "True" or "False":

1. In space, the speed of the satellite remains constant, due to the presence of air. (........)
2. When a balanced force is applied on an object, it will not move. (........)
3. By increasing the force applied in an object, the distance of motion will decrease. (........)
4. Friction force must exist to move bodies. (........)

3 Complete using the given words:

(Warm - longer - can't - Gravity - Energy - can)

1. The motion of a flying eagle .... be seen.
2. When we rub our hands, we feel ....
3. .... is the ability to do work.
4. Small trucks can move .... distance than larger trucks.
5. .... is an invisible force that holds us to the Earth's surface.

4 Write the scientific term:

1. It is the change in position of an object relative to its starting point. (........)
2. It is the action of pushing / pulling an object causing its motion. (........)
3. The force that opposes the motion of an object. (........)





SHARE

12 Record Evidence: Truck versus Airplane

Activity  **Record Evidence Like a Scientist**



How can you describe forces?

- It is the effect that causes the movement of objects, stops them and changes their direction.

Can you explain as a scientist, how forces act on a stationary object?

Claim:

A stationary truck, jet, or object will move when the forces acting on the object are unbalanced.

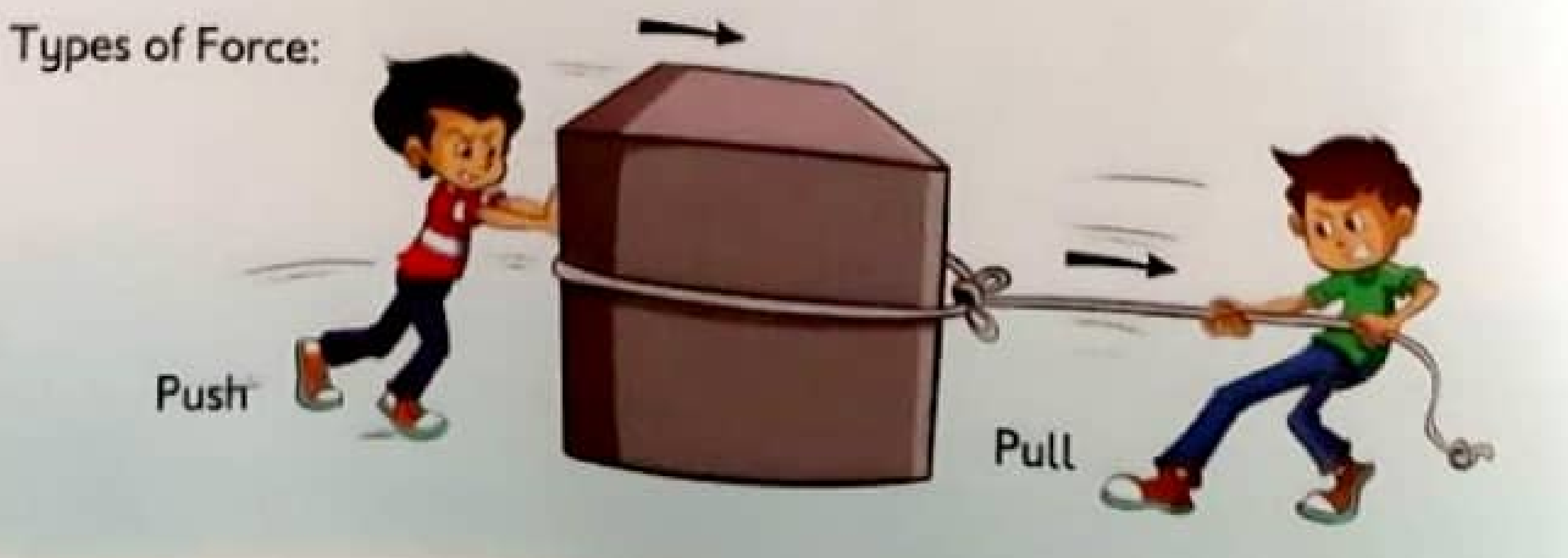
Evidence:

1. A door will stay closed unless a person pushes or pulls it open.
2. A rolling ball will stop when it hits the wall.

Scientific Explanation:

- Objects need a force to move.

Types of Force:











Definition

Force:

- The action of the push or pull applied on an object causing motion.

Balanced VS Unbalanced Force:

Balanced Force



- If the forces acting on the object are equal, it does not move from its position.

Unbalanced Force



- If the forces acting on the object are unequal, it moves in the direction of the greater one.

Definition

Friction Force:

- It is the force that opposes the motion of an object.

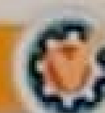
Definition

The work:

- Is the energy transferred by a force that is used to move the object.



13 Review: Starting and Stopping

Activity  Evaluate Like a Scientist

Complete the following diagrams to create a concept summary, then share it with your classmates:

Motion	
Force	
Energy	
Work	
Friction force	

The Types of Force

- Push
-

Things must occur to move an object

- A force must act upon the object
-

Reasons for the stopping motion

- Balanced force
-

Parents' Tips:

Help your child summarize what he/she has learned about starting and stopping objects, then share it with his/her classmates.

Exercises on Concept 1

(Answer Guide P. 8)

1 Choose the correct answer:

1. If a group of students play the game of the tug of war, the rope will move if the forces acting on the two sides are ....
   a. balanced
   b. equal in magnitude and opposite in direction
   c. unequal in magnitude and opposite in direction
2. When the force acting on a moving body increases, its speed will ....
   a. increase　　b. decrease　　c. not change
3. When we pull a box on the ground to the right direction, the friction force that exists between the box and the ground will act in the .... direction.
   a. left　　b. right　　c. south
4. A moving object moves faster when .... force is applied on it.
   a. more　　b. less　　c. friction
5. Rocket can move and get out of the planet ....
   a. during launch because the forces acting on it are balanced
   b. before launch because the forces acting on it are unbalanced
   c. during launch because the forces acting on it are unbalanced
6. From the following, if we push the two cars with the same force, what do you think which one of them will travel a greater distance?




   a. The green car.
   b. The red car.
   c. The two cars travel the same distance.

2 Complete the following sentences:

1. We need a .... to move an object.
2. When Ali kicked the ball, it moved away from his starting position and started to slow down until it stopped completely due to the effect of a .... force.
3. When you press the brakes of the bike, it is an example of the .... force.
4. Falling the book from your hand on the ground is considered .... force.
5. If an unbalanced forces are applied on an object, the object will ....
6. Objects stop moving when a .... force acting on them.
7. When you throw a ball, Earth's .... makes it fall downward.

3 Put (✓) or (✗):

1. A balanced force always causes a change in motion.
2. Energy gives us a force that enables us to do work.
3. Unbalanced forces affect the tree, so it does not move and remains static.
4. Sailboats move in the water due to the air force.
5. Gravity is the force that pulls objects downward the earth.
6. Forces have a magnitude and direction.
7. Force is a push or a pull.

4 Write the scientific term:

1. The change of the position of the body from one place to another. (..........)
2. The action of the push or pull applied on an object causing motion. (..........)
3. A force that slows down the motion of an object. (..........)
4. The ability to do a work. (..........)
5. The measure of energy transfer that occurs when an object is moved over a distance. (..........)

5 Complete using the given words:

(force - speed - balanced - motion - friction - unbalanced - pull)

1. When the position of the body changes from one place to another, this means that the body is in a state of ....
2. When the apple falls from the tree on the ground, this represents a .... force.
3. The effect of .... causes the bodies to move.
4. A body remains at rest when a .... force is applied to it.
5. A ball .... decreases when it moves in the left direction and there is another force that acts in the right direction.
6. The force that exists between two touching surfaces is called .... force.

6 What happens if ...?

1. The shockwave truck is equipped with three engines.
....
2. Sarah, Salma and Bassem pushed a chair to the right, while Islam pushed it to the left.
....
3. You increase pushing the pedals of the bike.
....
4. You lift your feet from the pedals during the motion of the bike.
....
5. The force acting on a moving object increases.
....

7 Match:

(A)

1. Energy enables us to do ______ ○
2. ______ force opposes the motion of the objects. ○
3. Using a force to move an object towards you is called a ______ force. ○
4. When an unbalanced force acts on a body at rest, it moves from a state of rest to a state of ______. ○

(B)

- ○ a. friction
- ○ b. work
- ○ c. motion
- ○ d. push
- ○ e. pull

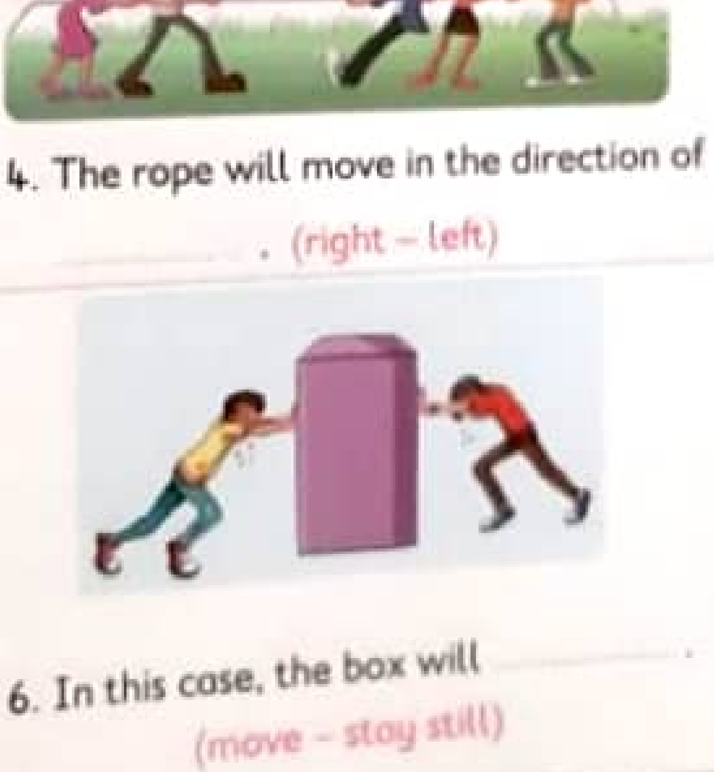
8 Look at the following, then choose the correct answer:

1. The acting force is a ______ force. (pushing – pulling)

2. The books exist in a ______ state. (rest – motion)

3. The force acting on the apple is a ______ force. (pull – push)

4. The rope will move in the direction of ______. (right – left)



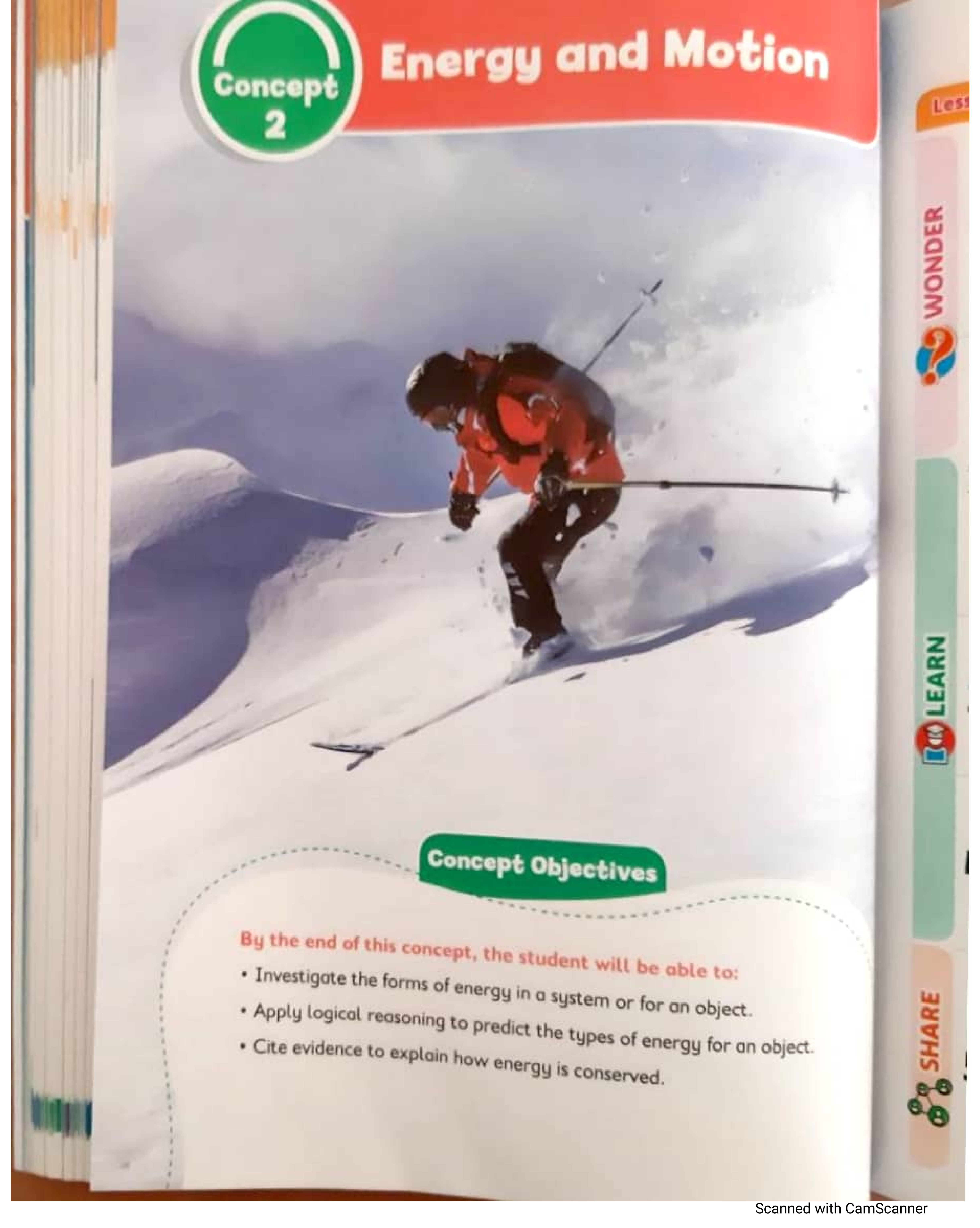
5. When the pushing pedal is increased, the speed of the bike ______. (increases – decreases)

6. In this case, the box will ______. (move – stay still)



7. Forces acting on barrels are ______. (balanced – unbalanced)

Concept 2 Energy and Motion



Concept Objectives

By the end of this concept, the student will be able to:

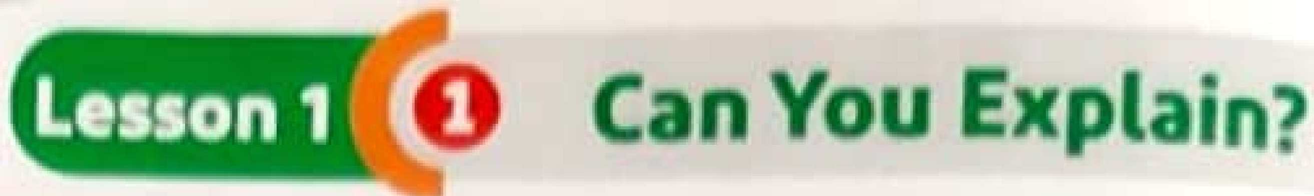
- Investigate the forms of energy in a system or for an object.
- Apply logical reasoning to predict the types of energy for an object.
- Cite evidence to explain how energy is conserved.

"Pacing Guide"

Lesson	Activity	Key Terms	Life Skills
WONDER 1	**1 Can You Explain?** • Student will use prior knowledge to explain the concept of energy of objects in motion.		
	2 Roller Coaster • Student will make observations about the roller coaster and ask questions about what happens to the energy used to make it move.	———	———
	3 Energy in the Classroom • Student will use prior knowledge of energy and apply it to identify different forms of energy in the objects found around us.	———	- The student can analyze a situation. - Decision-making.
	4 What Do You Already Know About Energy and Motion? • Student will construct a definition of energy using an example from daily life as evidence, then look at different images of objects in motion to explore the relationship between motion and energy.	———	- The student can share ideas he/she is not yet sure about. - Endurance.
LEARN 2	**5 Energy Basics** • Student will obtain evidence to construct explanation and supports his/her position about visible and invisible forms of energy; and the relationship between Energy and Work.	———	———
	6 Kinetic and Potential Energy • Student will analyze the given information about the kinetic and potential energy, then apply his/her understanding by explaining the visual data about different acrobats to determine who has the most potential energy.	- Potential energy - Kinetic energy	- The student can identify problems. - Critical-thinking.
3	**7 Forms of Potential and Kinetic Energy** • Student will understand the forms of potential and kinetic energy, and compare his/her prior knowledge with the obtained information.	- Chemical energy - Gravitational potential energy - Thermal energy	———
	8 Types of Energy • Student will apply the information about the types of potential energy obtained in the previous activity to discuss the types of energy and discuss how they change.	———	———
4	**10 Energy Transformation in Engines** • Student will use what he/she has learned to be able to explain the energy conversions in an engine and identify the examples of potential energy.	———	———
	11 Easy Life Tool • Student will share ideas to design a solution for converting a type of energy and making objects move that could ease his/her life.	———	- The student can decide on a solution to use. - Decision-making
SHARE 5	**12 Record Evidence: Roller Coaster** • Student will review and discuss his/her initial explanation about the Roller coaster based on the information obtained from the previous activities (types & forms of Energy).	———	———
	13 STEM in Action • Student will construct an explanation of how kinetic and potential energy involved in skating.	———	———
	14 Review: Energy and Motion • Student will record what he/she has learned about energy and motion in written form.	———	———



WONDER



Lesson 1 ① Can You Explain?



Warm-up

- Can an object move by itself? Yes ☐ No ☐



You have learned before that force is needed to make objects move or to stop.

And when we exert force on an object to make it move, it gains energy.

How do moving objects gain energy?

- All objects in motion have a type of energy produced which is known as motion energy (kinetic energy)

Examples:



1. Sand surfer have energy down the sand dunes quickly, so during sliding he has kinetic energy.
2. A static ball has no energy at the top of a hill, but as soon as it is rolled, it has motion energy.

Apply Like a Scientist

(Answer Guide P. 8)

Look at the following pictures and determine which one has energy of motion "kinetic energy":

a 

b 

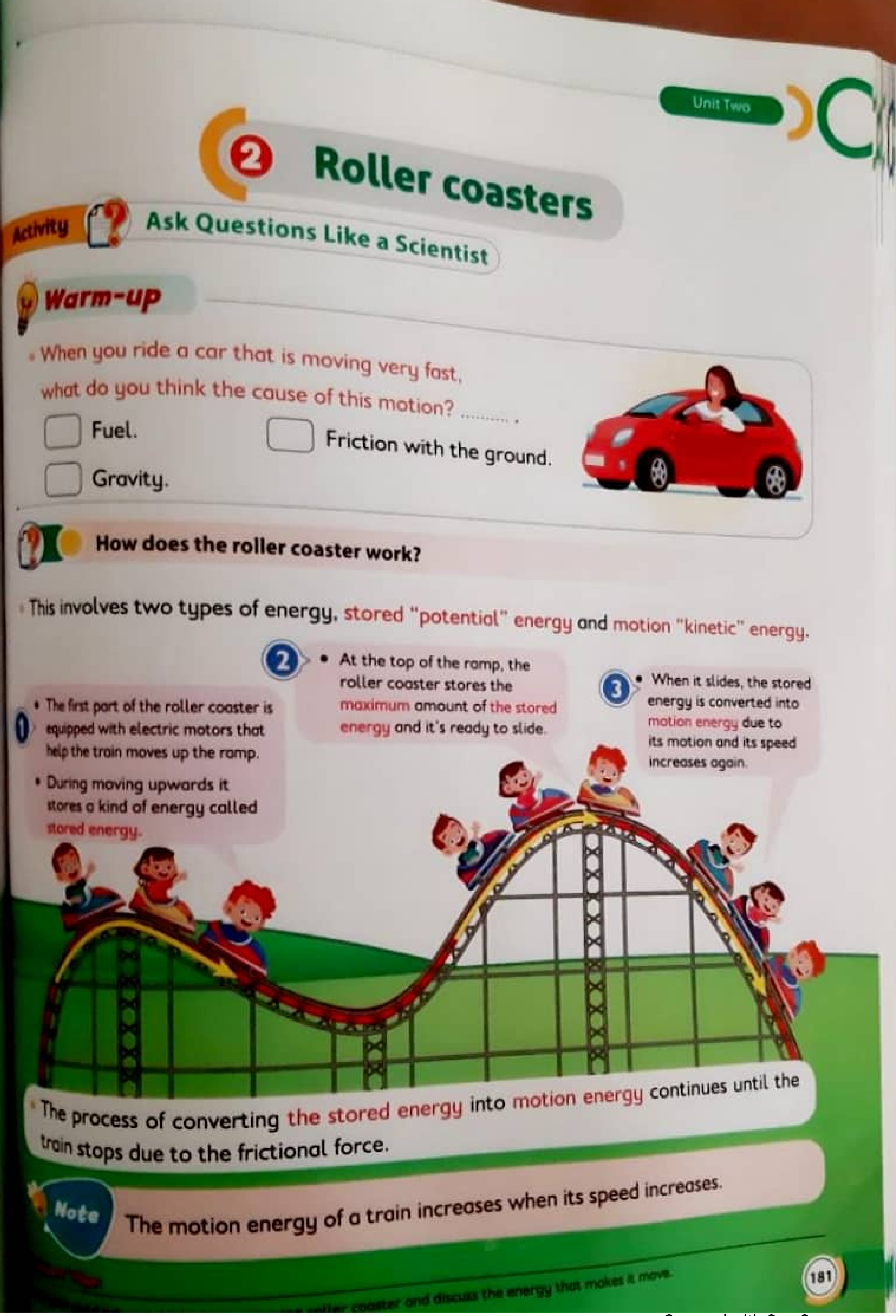
c 

d 

Parents' Tips:

Help your child ask questions and enhance his/her prior knowledge about how moving objects get energy to make connections in order to design safety features in a car by the end of the concept.





2 Roller coasters

Activity: Ask Questions Like a Scientist

Warm-up

- When you ride a car that is moving very fast, what do you think the cause of this motion? ....

☐ Fuel. ☐ Friction with the ground.

☐ Gravity.

How does the roller coaster work?

- This involves two types of energy, stored "potential" energy and motion "kinetic" energy.

1.
   - The first part of the roller coaster is equipped with electric motors that help the train moves up the ramp.
   - During moving upwards it stores a kind of energy called stored energy.
2.
   - At the top of the ramp, the roller coaster stores the maximum amount of the stored energy and it's ready to slide.
3.
   - When it slides, the stored energy is converted into motion energy due to its motion and its speed increases again.

- The process of converting the stored energy into motion energy continues until the train stops due to the frictional force.

Note The motion energy of a train increases when its speed increases.



WONDER



Conclude Like a Scientist

1. What happens to the roller coaster's energy when it goes down the ramp?

Answer
The stored energy converts to motion energy.

2. When does the roller coaster have the most stored (potential) energy?

Answer
Down the hill.

3. When does the roller coaster have the most Kinetic energy?

Answer
At the ground of the hill.

4. What happens to the roller coaster's energy when it stops?

Answer
It loses its energy of motion.

Apply Like a Scientist

(Answer Guide P. 8)

Put (✓) or (✗) :

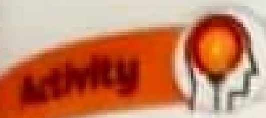
1- The energy of a moving body decreases when its speed increases. ☐

2- The roller coaster is not equipped with electricity and motors. ☐

3- A body loses its kinetic energy when it is at rest. ☐



3 Energy in the Classroom



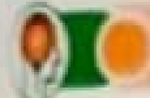
Think Like a Scientist



- **Energy** is very important in our lives, as we depend on it a lot.
- Most of the things around us use energy or store it.

Tick (✓) in front of the things in your house that use energy:



Forms of Energy:

- Objects around us store, use or produce energy.
- Energy has different forms and types.
- **Let's explore different things around us or even inside our classroom at school and think what forms of energy are used or produced:**

Examples:



Chemical energy

- Like the energy stored in the (dry cell) battery or food.





Kinetic energy

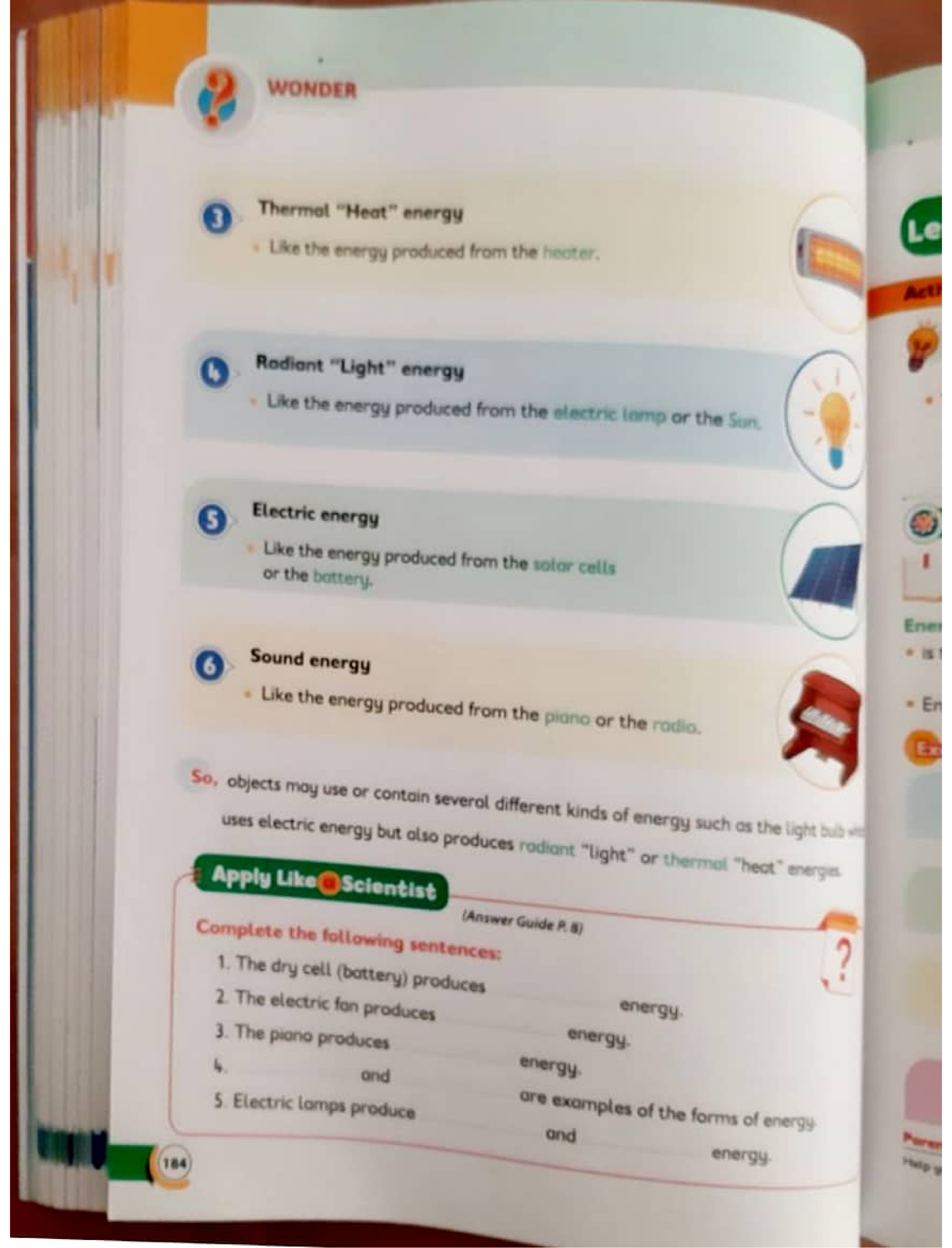
- Like the energy produced from the electric fan or during running.



Parents' Tips:

Help your child explore and think how the term energy is used in science by exploring examples of energy in different forms.





WONDER

3 Thermal "Heat" energy

- Like the energy produced from the heater.

4 Radiant "Light" energy

- Like the energy produced from the electric lamp or the Sun.

5 Electric energy

- Like the energy produced from the solar cells or the battery.

6 Sound energy

- Like the energy produced from the piano or the radio.

So, objects may use or contain several different kinds of energy such as the light bulb which uses electric energy but also produces radiant "light" or thermal "heat" energies.

Apply Like a Scientist

(Answer Guide P. 8)

Complete the following sentences:

1. The dry cell (battery) produces ________ energy.
2. The electric fan produces ________ energy.
3. The piano produces ________ energy.
4. ________ and ________ are examples of the forms of energy.
5. Electric lamps produce ________ and ________ energy.

Lesson 2 4 What Do You Already Know About Energy And Motion?

Activity Evaluate Like a Scientist

Warm-up

- Which energy is used when a solid (ice) melts into a liquid?

Heat energy ☐ Sound energy ☐

1 Importance of energy in our daily life:

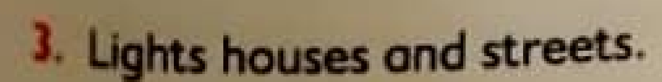
Definition

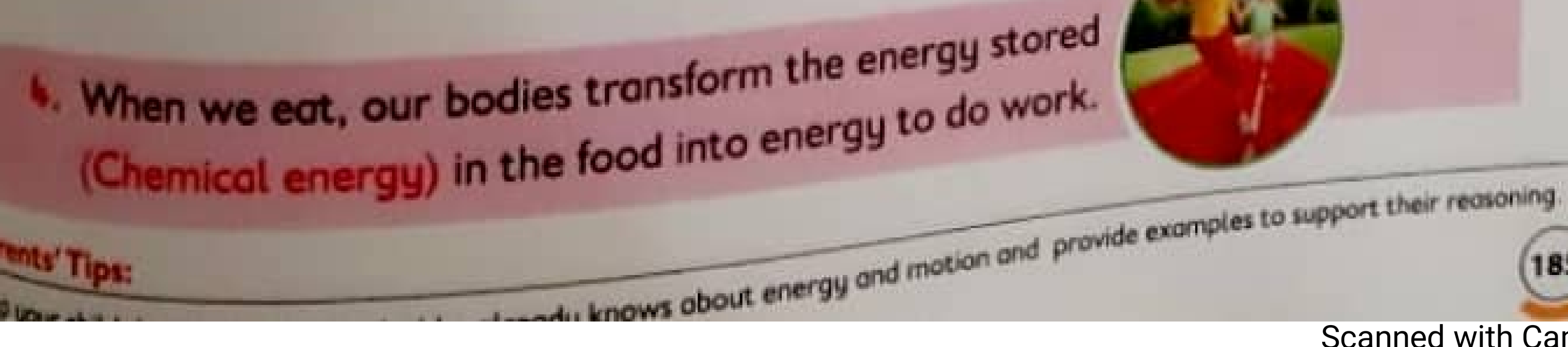
Energy:
- is the ability to do work.

- Energy, which is used all around us, is important for life.

Examples:

1. Affects the motion and position of objects.
2. Used to prepare food, heating and boiling water.
3. Lights houses and streets.







4. When we eat, our bodies transform the energy stored (Chemical energy) in the food into energy to do work.

Parents' Tips:
Help your child ... already knows about energy and motion and provide examples to support their reasoning.



2 Moving Energy:

- Energy can transfer from one object to another, but how does energy transfer?

Example:

A football player kicks a ball.

1. • **First:** The motion energy is transferred from the player's foot to the ball.

   So, the ball has no energy.





2. • **Then:** The ball moves in the air as a result of the transfer of the energy of motion "kinetic energy" from the player's leg to the ball.

   So, the ball has energy.

3. • **Finally,** the kinetic energy is transferred from the ball to the goal.

   So, the ball has energy.



Apply Like a Scientist

(Answer Guide P. 8)

Look, at the following picture, then answer using the given words:

motion - energy - transfers - gains

- Write the kinetic energy transmission when the table tennis player hits the ball.

1. First, the energy of .... transfers from the player's hands to the bat.
2. Then, the tennis ball moves as the energy .... to it when the bat hits it.
3. Finally, the ball stores .... which is transferred into kinetic energy again.

Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 8)

1 Choose the correct answer:

1. As the train moves faster, the kinetic energy ....
   a. increases b. decreases c. remains constant
2. The energy we gain from the food we eat is a .... energy.
   a. light b. chemical c. electric

2 Complete using the given words:

(**sound - potential - electric - heat - motion"kinetic"**)

1. The energy stored is an object is called .... energy, while the energy produced due to the movement of an object is called .... energy.
2. The energy needed to melt a cube of ice is .... energy.
3. The musical instruments produce .... energy.
4. Solar cells produce .... energy.

3 Put (✓) or (✗):

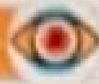
1. We can live without any source of energy. ( )
2. The kinetic energy is transferred from the football (at rest) to the player's foot. ( )
3. The gravity acts to push objects away from the Earth's surface. ( )
4. Energy is the ability to do work. ( )



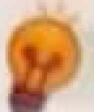
LEARN



5 Energy Basics



Activity — Observe Like a Scientist



Warm-up

Tick (✓) the image that indicates the usage of energy and the work done






- You have learned from the previous concept, that there is a relation between work and energy
- Energy is a part of everything that happens in the world and everything we do.

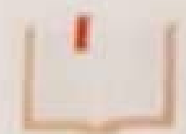
1 Explore the relation between Energy and Work:

- **Work** occurs when a force causes an object to move, and the force is produced by energy

Example:

A worker pushes a wagon.





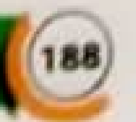
Definition

Work:

- is the force applied on an object or exerted by an object that causes motion.

Parents' Tips:

Help your child discuss the relationship between energy and work and know how energy is conserved and transferred



2 Main properties of energy:

Energy's main properties

1. **Energy can be stored and changed from one form to another.**

   Example:
   Energy conversion in the roller coaster game.



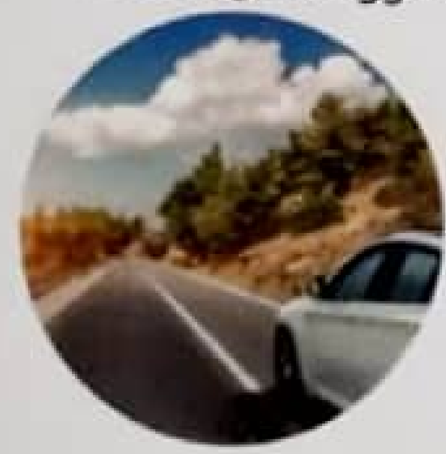
2. **Most forms of energy can't be seen.**

   Example:
   Heat, sound



3. **The work done by energy can be seen and measured.**

   Example:
   Light and measuring energy of motion



Challenge:

Talk with your classmates about the ways work and energy are related and list examples.

Apply Like a Scientist

(Answer Guide P. 8)



Put (✓) or (✗)

1. Energy doesn't change from one form to another. ( )
2. When you push a car and it doesn't move so there is a work done. ( )
3. Heat energy can be seen. ( )





6 Kinetic And Potential Energy

Activity  **Analyze Like a Scientist**



Warm-up

- Write down the type of energy in each of the following cases of the car.

(Stored energy or kinetic energy)

A



- After the rotation of the car's spring, it is ready to move.
  So, it gains .... energy.

B



- The car is in a motion state.
  So, it produces .... energy.

So, when you leave the spring of the toy, the stored energy changes into energy motion, causing the motion of the car.

Classification of energy.

Scientists classified energy into two categories

Potential Energy

- It is the stored energy in an object or the energy of position due to the work done on it.

Kinetic Energy

- It is the energy an object has due to its motion.



Dropping a book

A The work done when you raise the book up, causes storing of potential energy in the book.
(The book is ready to fall).



B When you leave the book, the potential energy changes into kinetic energy during falling down.

Parents' Tips:



Conclude Like a Scientist

What can be expected to happen to the acrobats which are shown in the following photo?

Answer

- The body of the first acrobat stores potential energy as it moves upwards.

↓

- When the first acrobat jumps his potential energy is converted into kinetic energy.

↓

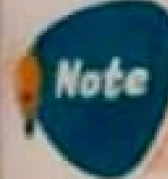
- The produced kinetic energy is transferred to the acrobat at the bottom of the tower, then propels the other into the air.

↓

- The energy that propelled the second acrobat upwards is converted gradually to potential energy.







Note

- The **higher** the body above the Earth's surface, the **greater** potential energy stored inside it.
- When an object stores potential energy, this means that this object is ready to do work.

Apply Like a Scientist

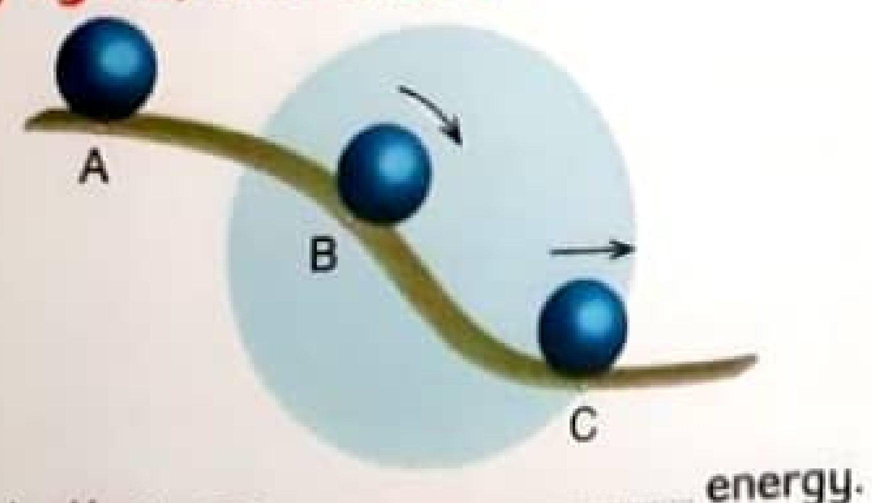
(Answer Guide P. 8)



A) Write the scientific term:

1. It is the stored energy in an object due to the work done on it. (..............................)
2. It is the energy that causes the motion of a body. (..............................)

B) Look at the following figure, then answer:



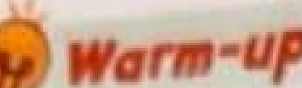
1. At position (A) , the ball stores .... energy.
2. At position (B), the .... energy changes into .... energy.
3. At position (C), the kinetic energy equals ....



LEARN

Lesson 3 (7) Forms of Potential And Kinetic Energy

Activity  Analyze Like a Scientist



Warm-up

- **Write the type of energy (potential or kinetic) for each of the following cases:**
  1. The transfer of sound from the car horn to our ears. (..................)
  2. The car is at rest (doesn't move). (..................)
- **Energy can be stored in objects in different forms.**



1 Forms of potential energy.

- The amount of potential energy stored in objects, when it is lifted from its original position depends on its height and its mass.

So, by increasing the height and the mass of an object, the stored potential energy in it will increase.

Examples:

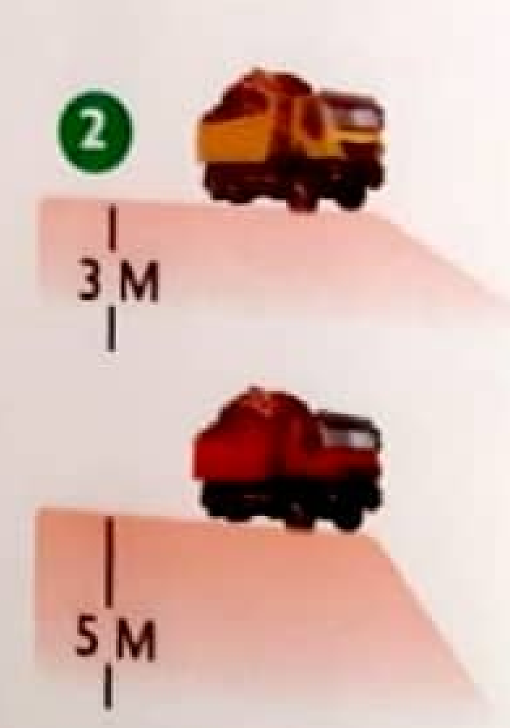
1





At the same height, the red car has larger mass, so it has higher potential energy than the yellow car.

2



When they have the same mass, the red car is on a higher height so it has a higher potential energy than the yellow car.

Parents' Tips:

Help your child to categorize different forms of potential and kinetic energies and the visible and invisible energies using real-world examples.



Forms of potential energy

1 Gravitational potential energy

2 Chemical potential energy

Gravitational Potential energy

1

A. The Earth attracts objects to its surface. by a force called gravitational force (gravity).

B. When we raise objects up against the Earth's gravity, the objects store potential energy.

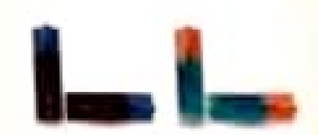
Example: **The ball at the top of the hill stores gravitational potential energy by which it can roll over the top of the hill.**



Chemical Potential energy

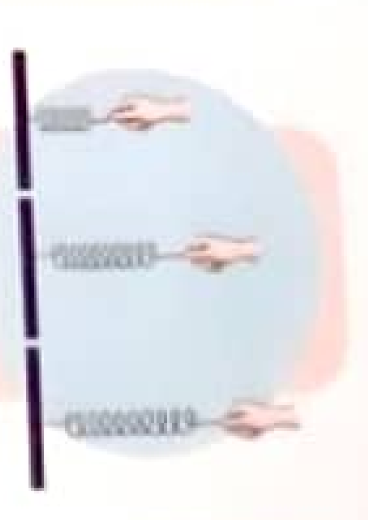
2

Example: **Batteries have a stored chemical potential energy that is not used until the battery is connected to an electric circuit.**



Note

- A compressed spring stores potential energy that could be suddenly released if you are not careful, this energy is also an example of the potential energy stored in objects.

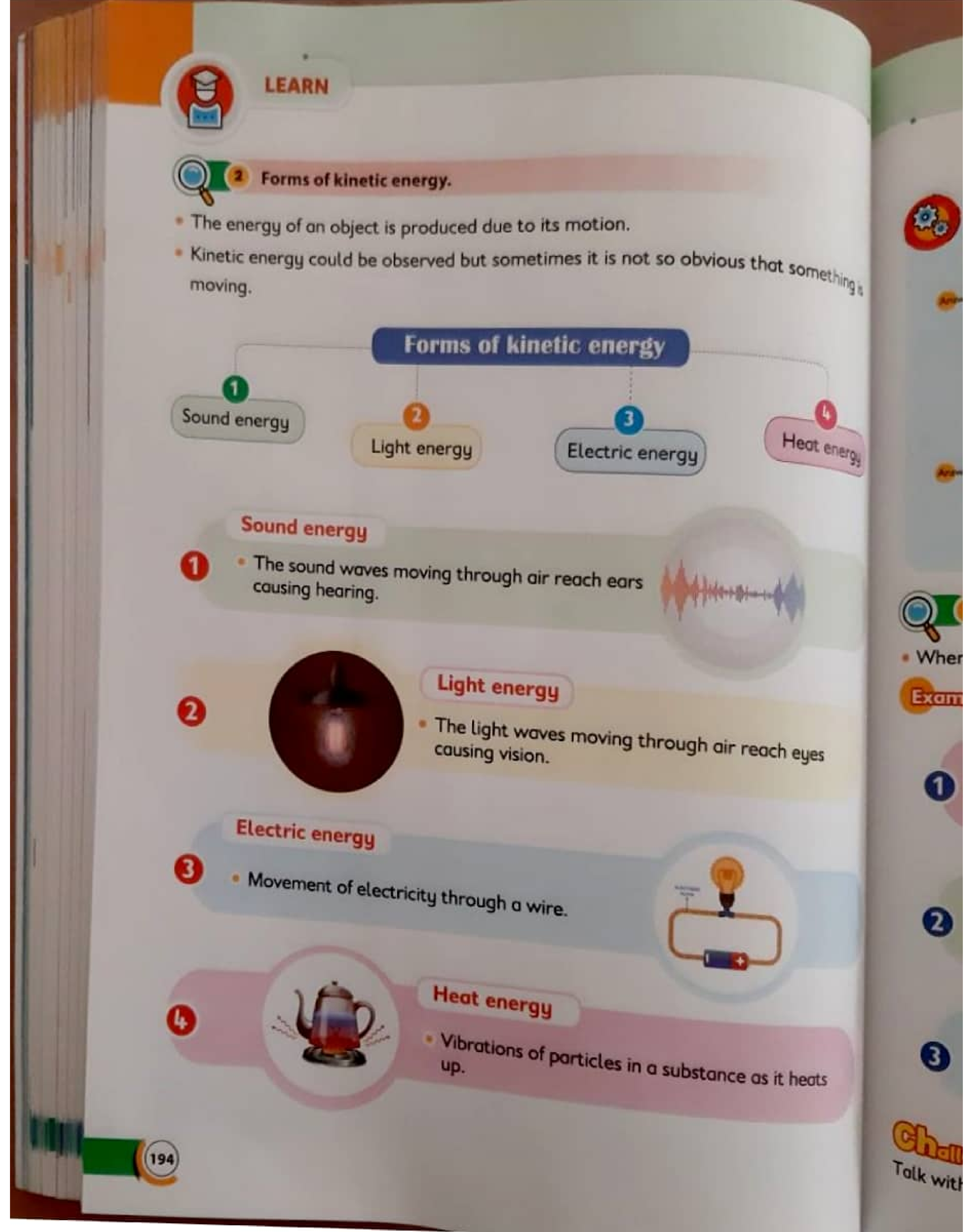


Conclude Like a Scientist

- What is the form of potential energy produced when roller coaster cars are dragged up the first hill?



(Gravitational potential energy).



LEARN

2 Forms of kinetic energy.

- The energy of an object is produced due to its motion.
- Kinetic energy could be observed but sometimes it is not so obvious that something is moving.

Forms of kinetic energy

1. Sound energy
2. Light energy
3. Electric energy
4. Heat energy

1 Sound energy

- The sound waves moving through air reach ears causing hearing.

2 Light energy

- The light waves moving through air reach eyes causing vision.

3 Electric energy

- Movement of electricity through a wire.

4 Heat energy

- Vibrations of particles in a substance as it heats up.

Conclude Like a Scientist

1- What is the form of energy which the potential energy is converted into when a roller coaster goes down?

Answer: (Kinetic energy).

2- If an egg falls from your hand:

a) What force pulls it to the ground?

b) What kind of energy does the egg have as it falls?

c) From where did the egg get the energy to fall?



Answer:

a) Gravitational energy.

b) Kinetic energy.

c) The egg gets energy, when you raise it up it stores potential energy.

3 Energy transformation.

- When force is applied on an object, its energy can change from one form to another.

Examples:

1. A child at the top of a slide and tends to slide, so potential energy is converted into kinetic energy.



2. The potential energy in the car motor changes into kinetic energy, when the car moves.

3. The electric fan blades rotate: Electric energy is converted into kinetic energy.





Challenge:

Talk with your classmates about new examples of energy transformation from your daily life.





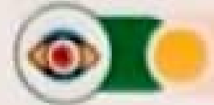
8 Types of Energy



Warm-up

- Does energy transform from one form to another? Yes ☐ No ☐

So, all forms of energy are always related to either potential energy or kinetic energy.



Energy transformation:

- The following table shows different examples of energy transformation.

Tool	Energy used	Energy produced
1. Torch	• Chemical energy stored in the battery.	• Light energy • Heat energy
2. Gas Oven	• Chemical energy stored in the natural gas.	• Heat energy
3. Body cells	• Chemical energy stored in food.	• Kinetic energy
4. Spring-powered toy car	Potential energy stored in the spring due to its rotation.	• Kinetic energy
5. Car	Chemical energy stored in the gasoline (fuel) inside the car's engine.	• Kinetic energy (movement of the car) • Heat energy • Sound energy

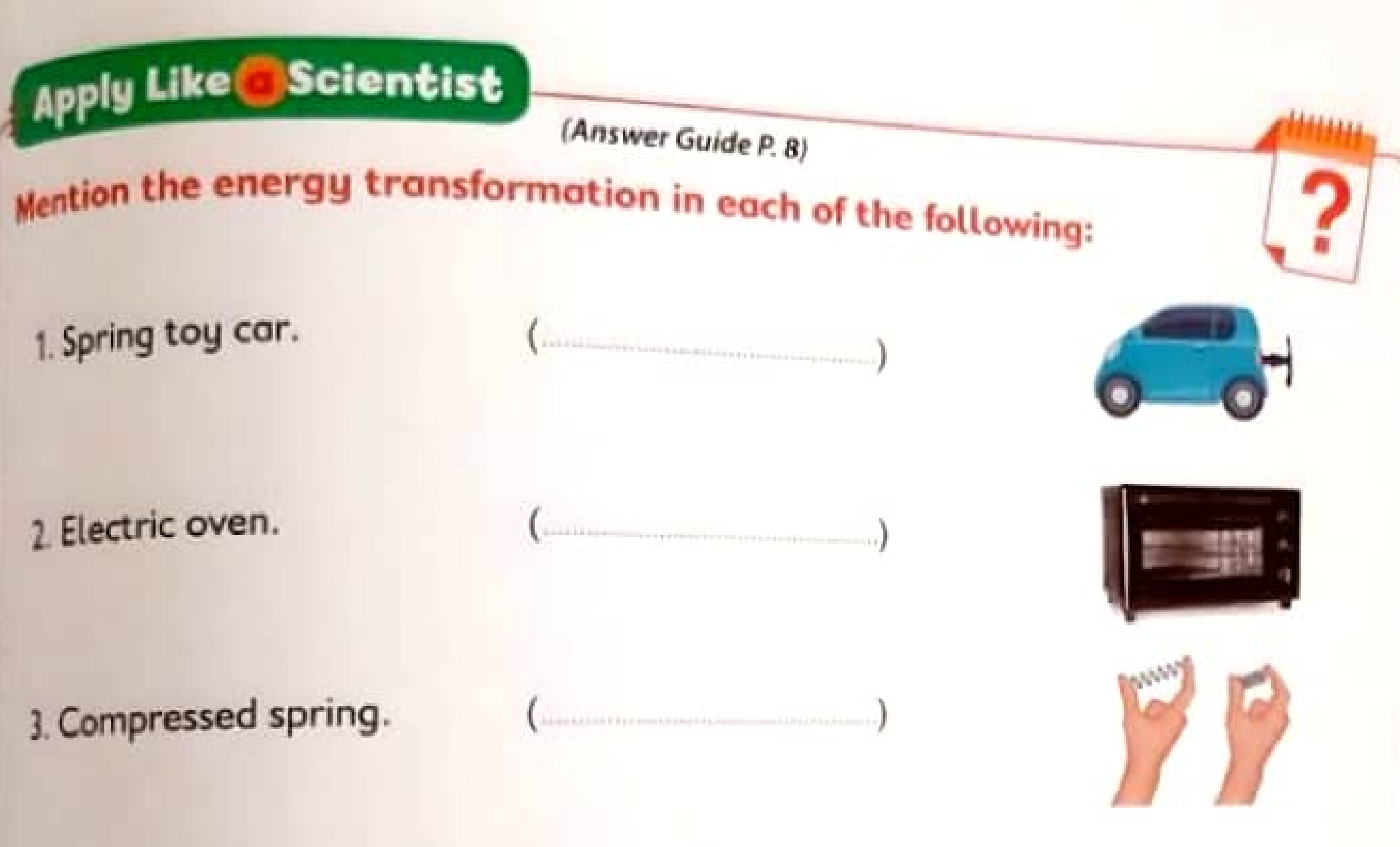
Parents' Tips:

Help your child explore real-world examples to better understand the transformation of energy from potential to kinetic or vice versa.



Challenge:

List two examples of potential energy being converted into kinetic energy from them identify the types of energy involved. Then, share a new example of this transformation from your daily life.



Apply Like a Scientist

(Answer Guide P. 8)

Mention the energy transformation in each of the following:

1. Spring toy car. (..............................)
2. Electric oven. (..............................)
3. Compressed spring. (..............................)

9 Optional Digital Activity



Forms of Energy

- You have studied before that potential energy and kinetic energy are from the forms of energy.
- To gather more information about other forms of energy and their uses in our life, use the Egyptian Knowledge Bank.



Lesson 4 (10) Energy Transformation in Engines

Activity — Analyze Like a Scientist

Warm-up

- Could objects move without work exerted or force applied on them?

  Yes ☐ No ☐

- Vehicles need fuel in order to move and work, gasoline is a kind of fuel that is used by cars

1 How do vehicles operate using fuel?

- The chemical energy stored in fuel (gasoline) is converted into kinetic energy that the vehicle needs to move.
- When the internal combustion engine works, some of the stored energy "Chemical energy" is converted into heat and sound energies.

A: Chemical energy stored in gasoline provides the car with energy needed to operate.

B: Inside the internal combustion engine, the gasoline burns safely and provides it with the energy needed for its motion.

Energy conversions in the car:

Chemical energy (stored in fuel)



- Mechanical kinetic energy
- Thermal energy
- Sound energy

Parents' Tips:

Help your child describe the energy conversions that take place in an engine regarding the law of conservation of energy.

2 Co

- The potent (disappear) law of co

Law of con

- Energy is



Con

1- En

Answer

2- T e

Answer

App

Write

1. Ene fro
2. The
3. Ene veh

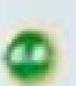
2 Conservation of energy:

The potential energy stored in an object that starts to move, does not diminish (disappear), but it is simply converted into kinetic energy during its motion according to **law of conservation of energy.**

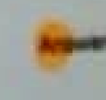
Law of conservation of energy:

Energy is neither created nor destroyed, but it is converted from one form into another.

Conclude Like a Scientist

1- Energy conversions occur within the internal combustion engine. 

Answer: Because the chemical potential energy stored in the fuel (gasoline) is converted into kinetic energy.

2- The energy conversion in the engine of a car is like what happens during eating food in the human body. 

Answer: Because burning of chemical potential energy stored in food is converted into kinetic energy that helps us do our daily activities and the internal combustion engine transforms the chemical energy of gasoline into kinetic energy and heat energy.

Apply Like a Scientist



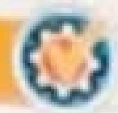
(Answer Guide P. 8)

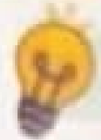
Write scientific term for each of the following:

1. Energy is neither created nor destroyed, but it is converted from one form into another. (..........)
2. The energy stored in the fuel. (..........)
3. Energy produced from the burning of fuel safely inside the vehicle engine. (..........)



11 Easy Life Tool

Activity  Evaluate Like a Scientist



Warm-up

- When the electric saw is invented, it made cutting wood and trees much easier faster than the manual saw.



Potential energy into Kinetic energy.



Electric energy into Kinetic energy.

According to law of conservation of energy, can we design a tool that makes daily tasks easier?

Yes ☐ No ☐



A tool for an easier life:

- Technology helped us invent robots that help us in many fields of life.
- Let's explore the energy transmission in a robot that helps us in opening a bottle as an example



1. The robot is powered by batteries
2. The chemical energy stored in the batteries is converted into electric energy.
3. The electric energy is converted into kinetic energy when the robot hands move to open the bottle.

Apply Like a Scientist

(Answer Guide P. 8)

Complete the following sentences to identify the energy transformation that occurs when:

(thermal - electric - solar)

1. First, the .... energy from the sun is converted into .... energy.
2. Then, the .... energy is converted into .... energy.

Parents' Tips:

Help your child identify different types of energy and design a simple machine to demonstrate the energy conversions.

Al-Adwaa Exercises

on Learn Activities

(Answer Guide P. 9)

1 Choose the correct answer:

1. Winding (rotate) the spring of a toy car, stores .... energy.

   a. kinetic b. heat c. potential

2. Gravitational energy is a form of .... energy stored in an object located away from the Earth's surface.

   a. electric b. potential c. Retire

3. Using the manual saw, changes the potential energy within the human body into .... energy.

   a. kinetic b. gravitational c. electric

4. The washing machine changes .... energy into kinetic energy.

   a. chemical b. electric c. heat

2 Put (✓) or (✗):

1. When a child plays with a swing, at a maximum height, the gravitational energy changes into kinetic energy. ( )
2. The stored energy can't change from one form to another. ( )
3. Sound wave is a form of potential energy. ( )
4. Chemical and sound energies are forms of kinetic energy. ( )
5. In a car, the chemical energy changes into mechanical kinetic energy. ( )

3 Complete using the given words:

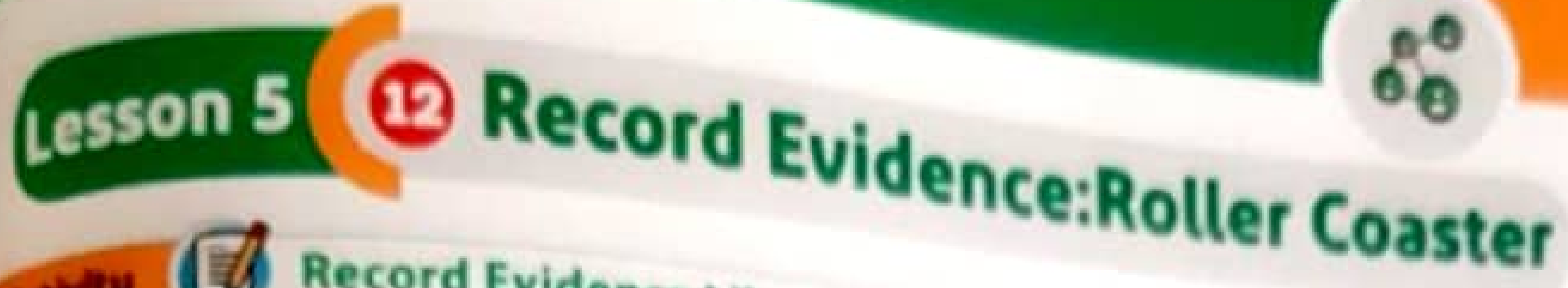
(potential - light - seen - thermal - gasoline - kinetic - burns - unseen)

1. Light energy is a/an .... form of energy, while the sound energy is a/an .... form energy.
2. When you leave the pencil to fall down, the .... energy changes into .... energy.
3. In .... bulb, chemical energy changes into .... and .... energies.
4. Inside the car engine, the fuel .... to provide the car with energy to move.

4 Write the scientific term for each of the following:

1. A form of potential energy that pulls objects towards the ground. (....................)
2. The waves that travel through air and can be seen. (....................)
3. Energy is neither created nor destroyed, but it is converted from one form to another. (....................)

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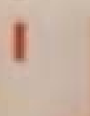


Lesson 5 ⑫ Record Evidence:Roller Coaster



Activity: Record Evidence Like a Scientist

- Now, after you have learnt the types of energies and how they are changed from one form to another.



Definition

Energy:

- Is the ability to do work or make a change.

Work:

- Is the force applied on an object or exerted by an object that causes motion.

- **Energy is classified into two types:** Potential energy and kinetic energy.
- **Forms of potential energy:** Gravitational energy-Chemical energy.
- **Forms of kinetic energy:** Sound energy-Radiant "light" energy-Electric energy-Thermal "Heat" energy.
- Now, Act like a scientist by following the scientific method to review an idea:

How do moving objects gain energy?

Claim

- Objects gain kinetic energy that enables them move, when it is converted from another form of energy according to law of conservation of energy.

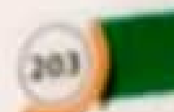
Evidence

- Potential energy is converted into kinetic energy ➡ Spring of a toy car
- Electric energy is converted into kinetic energy ➡ Electric saw
- Chemical energy is converted into kinetic energy ➡ Vehicle engine



Parents' Tips:

Help your child revise what he/she has learned about types of energy, the relation between energy and work, energy conversions and transformation.





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How does the roller coaster work?

Claim

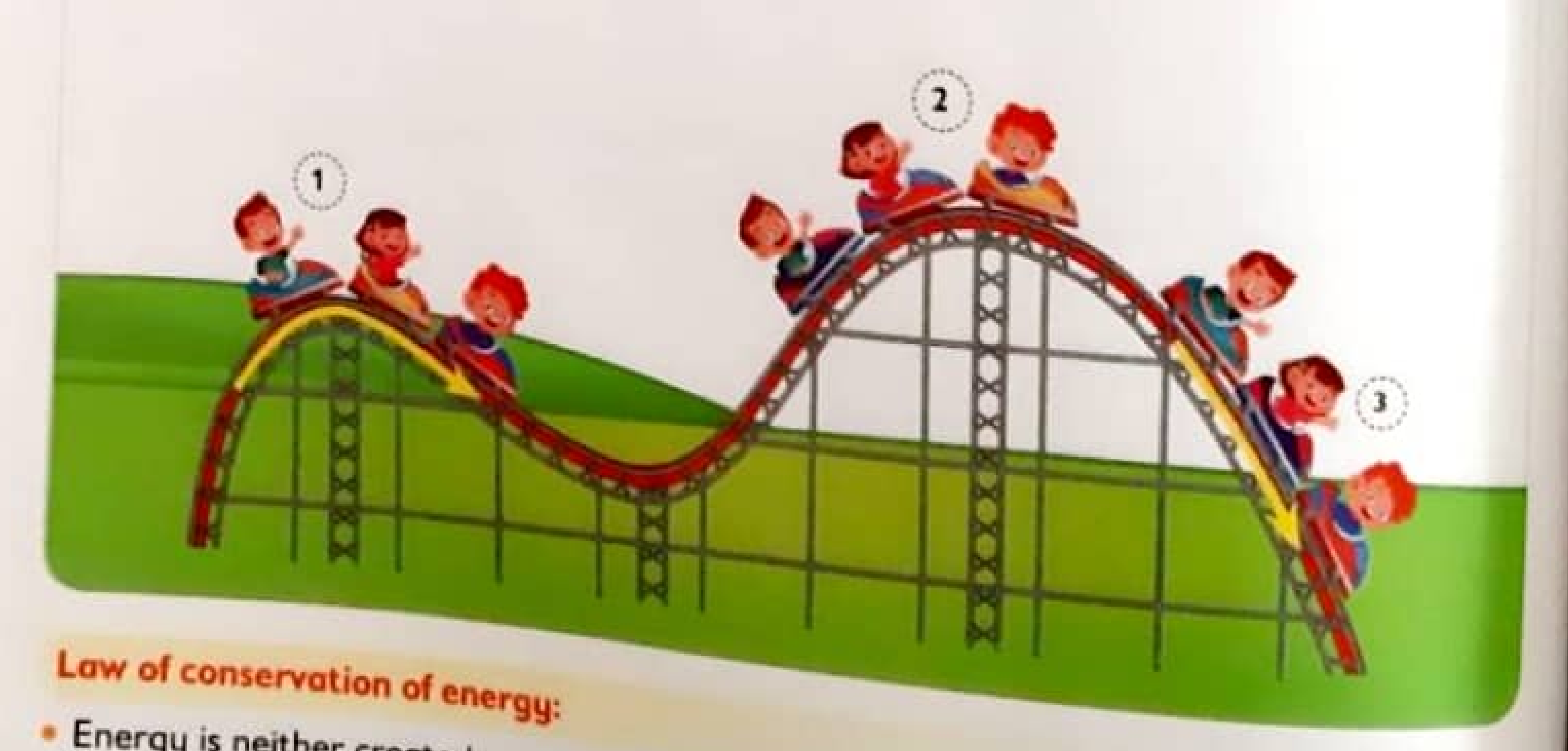
- The roller coaster gains a kind of energy that is converted from one form into another which allows it to move.

Evidence

- Alternation between potential energy and kinetic energy occurs until an external force affects the roller coaster causing its stopping.

Scientific Explanation

1. At the starting point: In the front-end of the roller coaster the electric energy produced by the motor provides the roller coaster with potential energy stored in it, then it is converted into kinetic energy and it moves upwards.
2. At the top of the hill: The kinetic energy decreases and converts into potential energy until maximum potential energy is stored.
3. During sliding: The potential energy stored is converted again into kinetic energy and the roller rushes down by the effect of gravity.



Law of conservation of energy:

- Energy is neither created nor destroyed, but it is convert





13 STEM in Action

Kinetic Energy and Potential Energy in Winter Sports





Activity — Analyze Like a Scientist

Ice-skating

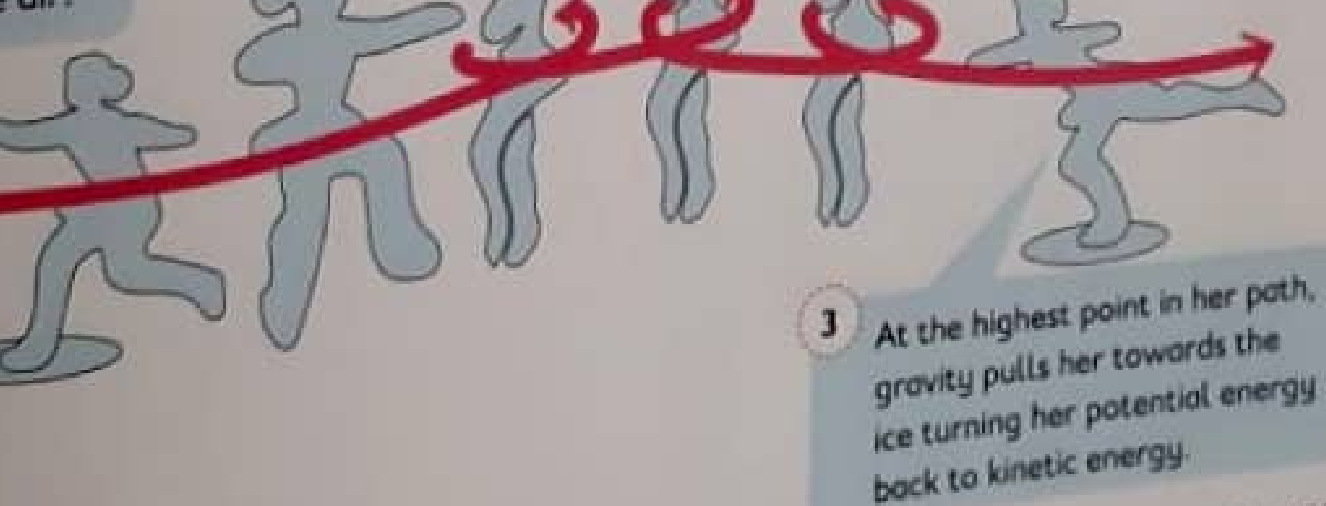


- Ice-skating is a popular winter sport in many countries, where the best skiers participate in the Winter Olympics.
- This sport is a good example for the conversions between the types of energy.
- An ice skater can jump and land during skating on only one skate.



1 Energy conversion during skating:

- The type and the amount of energy change as the player skates depending on how the player moves.



- Ice skaters not only learn skating and jumping skills, but also learn how to be strong and confident, they also know the quality of food to eat in order to supply their bodies with the energy needed to ski and lead a healthy life.

Parents' Tips:
Help your child build an explanation to apply what he/she knows about energy and motion to an Olympic sport.



SHARE



Conclude Like a Scientist

- Sometimes the skater has the least kinetic energy, but sometimes the skater has the most kinetic energy. 

Answer

Because the skater at the start of the movement has the least amount of kinetic energy but the most potential energy, while when flipping in the air and jumping the kinetic energy is the most.

2 More Potential Energy or More Kinetic Energy:

Around the world, there are many winter sports that the people love to play and energy conversions could be observed.

- Observe the following pictures, then answer:



When the player at rest, he/she stores .... energy.



During sliding from the top of the hill, the .... energy is converted into .... energy.



At the top of the jump, ... energy is gained.



When the hockey player hits the ball, the .... energy of the bat is transferred to the ball causing its .... that appears in the form of .... energy.



After you have learnt the forms of energy, the conversion between the forms of energy and role of energy in winter games.

Do research in the following fields about athletes, energy and motion in an Olympic sport.



1. **Science**
   - Look for the most important food that helps strengthening the body's muscles of an athlete.



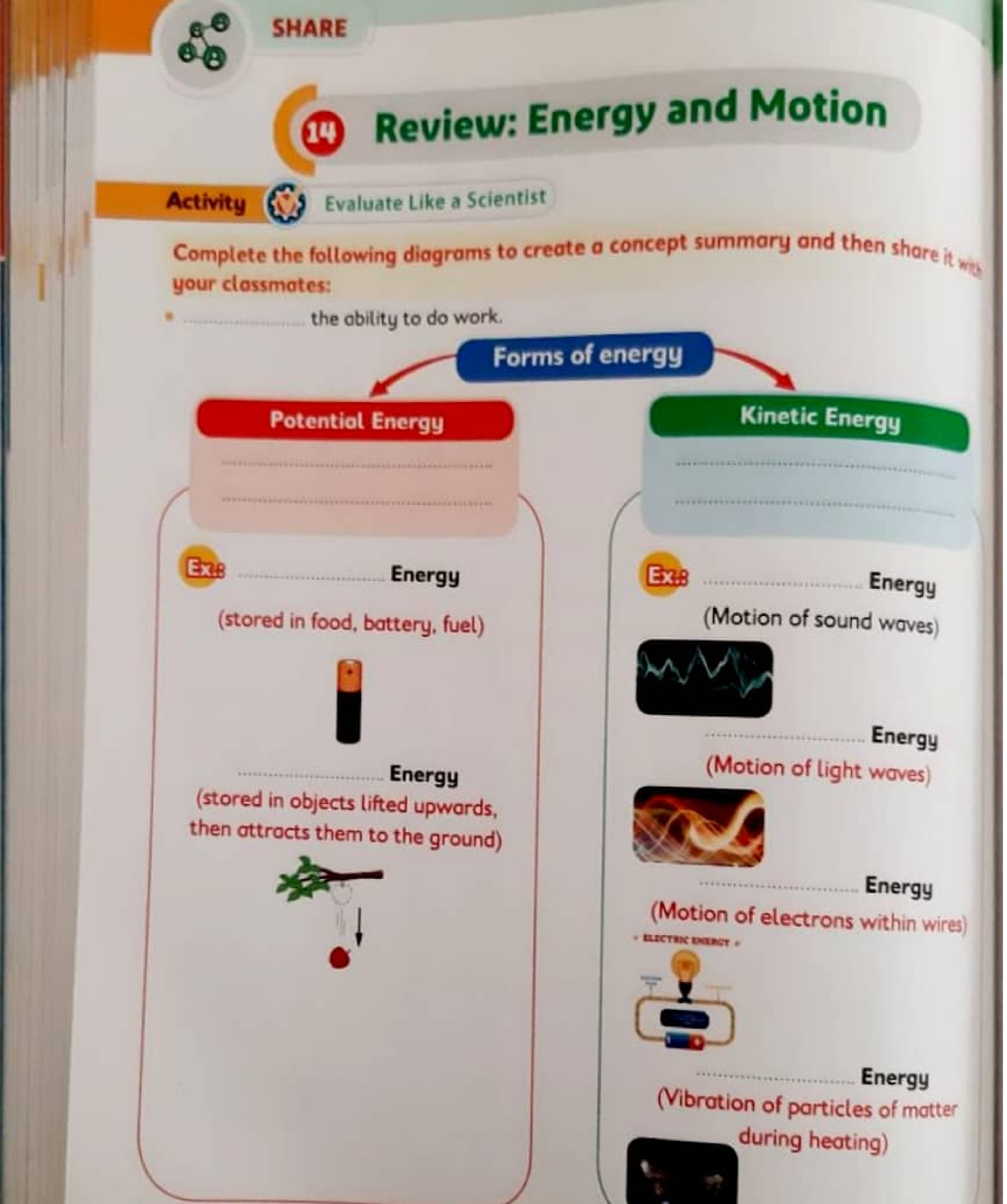
2. **Technology**
   - How to make an ice sled and develop its manufacture and the right protection tools for the player during skiing.



3. **Engineering**
   - Make a design whose dimensions are 10 cm x 20 cm of a skating platform with different heights.



4. **Mathematics**
   - Make a graph that expresses the change in the potential energy and the kinetic energy during skating.



SHARE

14 Review: Energy and Motion

Activity Evaluate Like a Scientist

Complete the following diagrams to create a concept summary and then share it with your classmates:

- ………………… the ability to do work.

Forms of energy

Potential Energy

…………………………………

…………………………………

Ex.: ………………… **Energy**

(stored in food, battery, fuel)

………………… **Energy**

(stored in objects lifted upwards, then attracts them to the ground)

Kinetic Energy

…………………………………

…………………………………

Ex.: ………………… **Energy**

(Motion of sound waves)

………………… **Energy**

(Motion of light waves)

………………… **Energy**

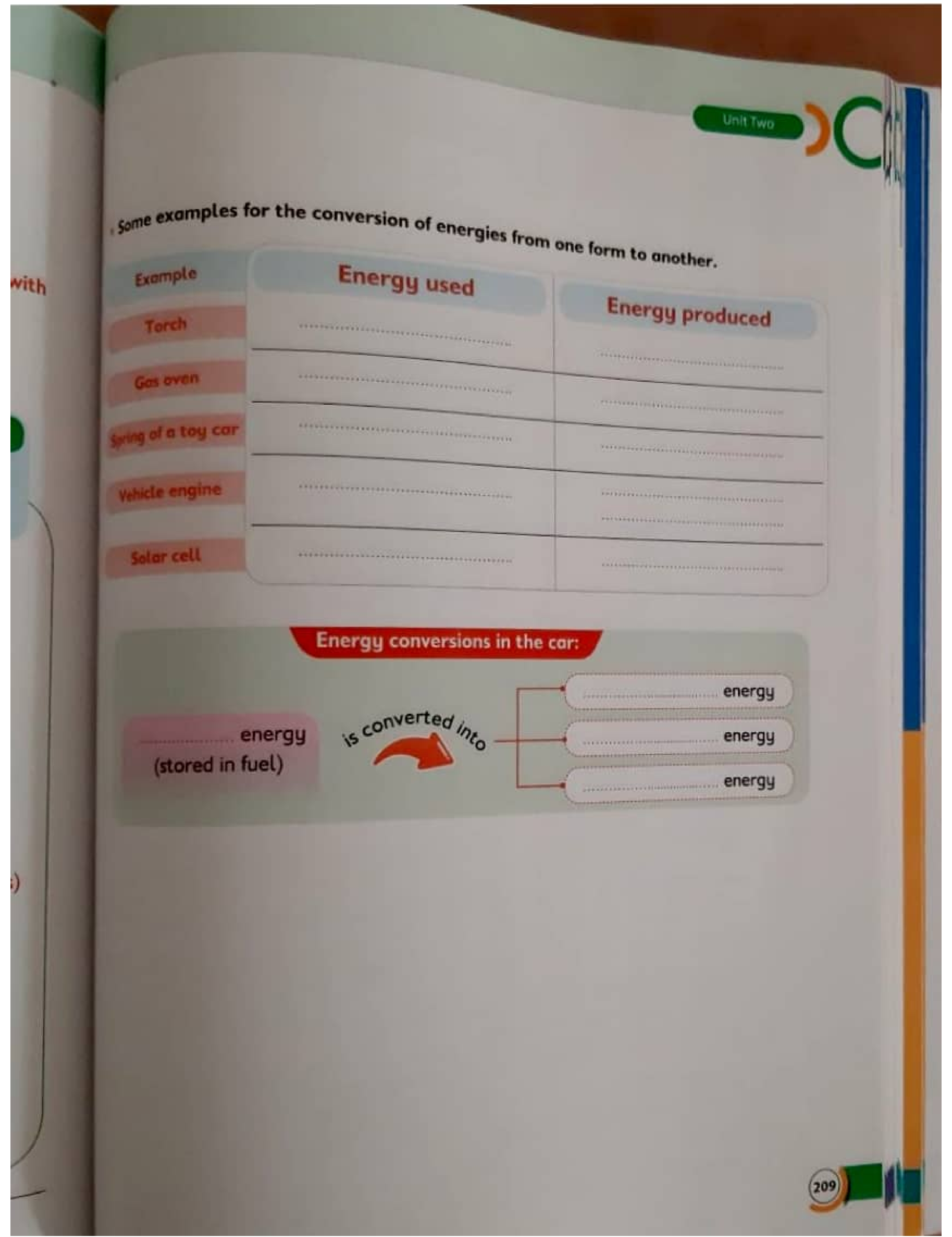
(Motion of electrons within wires)

………………… **Energy**

(Vibration of particles of matter during heating)

Parents' Tips:

Help your child summarize what he/she has learned about types of energy, the relation between energy and work, energy conversions and transformation, then let him/her share it with his/her classmates.



- Some examples for the conversion of energies from one form to another.

Example	Energy used	Energy produced
Torch	....	....
Gas oven	....	....
Spring of a toy car	....	....
Vehicle engine	....	....
Solar cell	....	....

Energy conversions in the car:

Al-Adwaa Exercises on Concept 2 (Answer Guide P. 9)

1 Choose the correct answer:

1. Which of the following cases represents the kinetic energy?
   a. A ball at the valley (at rest).
   b. A ball floating on the water surface.
   c. A ball on the top of a hill (at rest).
   d. A ball rolling down a valley.

2. As the roller coaster goes down it produces .... energy.
   a. sound b. light c. kinetic d. potential

3. The roller coaster has no kinetic energy when it ....
   a. goes downhill b. goes horizontally
   c. goes uphill d. stops moving

4. The energy stored in food is a/an .... energy.
   a. heat b. electric c. chemical d. sound

5. Which of the following stores elastic potential energy?
   a. A compressed spring b. A ball on the top of the hill (at rest).
   c. Fuel d. Electric bulb (lamp)

6. The car .... help(s) in burning the fuel, and converting the potential energy into kinetic energy.
   a. tires b. car bulbs c. safety belt d. engine

7. While riding a bike, the energy transforms from ....
   a. solar energy to chemical energy
   b. kinetic energy to nuclear energy
   c. heat energy to potential energy
   d. chemical energy to kinetic energy

8. Which of the following balls have a kinetic energy and doesn't have a potential energy?
   a. A bouncing ball.
   b. A ball rolling over a flat surface.
   c. A ball sliding down an inclined surface.
   d. A ball on a high shelf.

9. While clapping, the kinetic energy changes into ....

a. potential energy and solar energy

b. chemical energy and the rest are lost

c. sound energy

d. sound energy and the rest are lost

10. If a boy throws a ball upward, it will drop down hitting the ground and keep bouncing in the air; what will happen to its energy?

a. The energy will not change.

b. The amount of energy will increase, due to bouncing.

c. Some energies are lost during the ball's bouncing.

d. Some energies change into other forms.

2 Complete the following using the given words:

(sound – light – electric – chemical – gravitational – heat - kinetic)

1. When a dog barks, ... energy is produced.
2. When a ball rolls down an inclined surface .... energy changes into kinetic energy.
3. The battery of a cell phone uses .... energy.
4. When an ice hockey athlete skates on the ice, he/she uses .... energy.
5. When you touch a cup of tea, you feel hot, this represents a .... energy.
6. In the car's engine, when the fuel burns, the stored chemical energy comes out in the form of .... , ... energies and light energy.
7. When we use a flashlight in a camping trip, it uses .... energy.

3 Put (✓) or (✗):

1. Objects in motion, have a potential energy more than the objects at rest. ( )
2. A ball rolling down on an inclined surface, its potential energy increases gradually. ( )
3. The food for humans, acts as the fuel for vehicles. ( )
4. The energy changes from one form to another, but it never destroys. ( )
5. Sound energy is a form of the potential energy. ( )
6. On rubbing hands, the heat energy changes into kinetic energy. ( )

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4 Write the scientific term for each of the following:

1. The ability to do work. (..................)
2. The energy stored by an object. (..................)
3. The energy of an object is the energy produced, due to its motion. (..................)

5 What happens if...?

1. Burning fuel in a car's engine.

....

2. When a roller coaster slides down. (Regarding energy changes).

....

6 Give a reason for:

1. The food for humans, act as the fuel for vehicles.

....

2. The potential energy of a man standing on the top of a hill, is greater than the potential energy down the valley.

....

7 What is meant by...?

1. Energy.

....

2. Potential energy.

....

3. Kinetic energy.

....

8 Mention the energy used and the energy produced in each of the following cases:

	Used energy		Tool/ Device		Produced energy
1.	....	›	Electric bulb	›	....
2.	....	›	Gas Oven	›	....
3.	....	›	Bicycle	›	....
4.	....	›	Radio	›	....

9 Look at t

A) 1. Wh

2. Wh

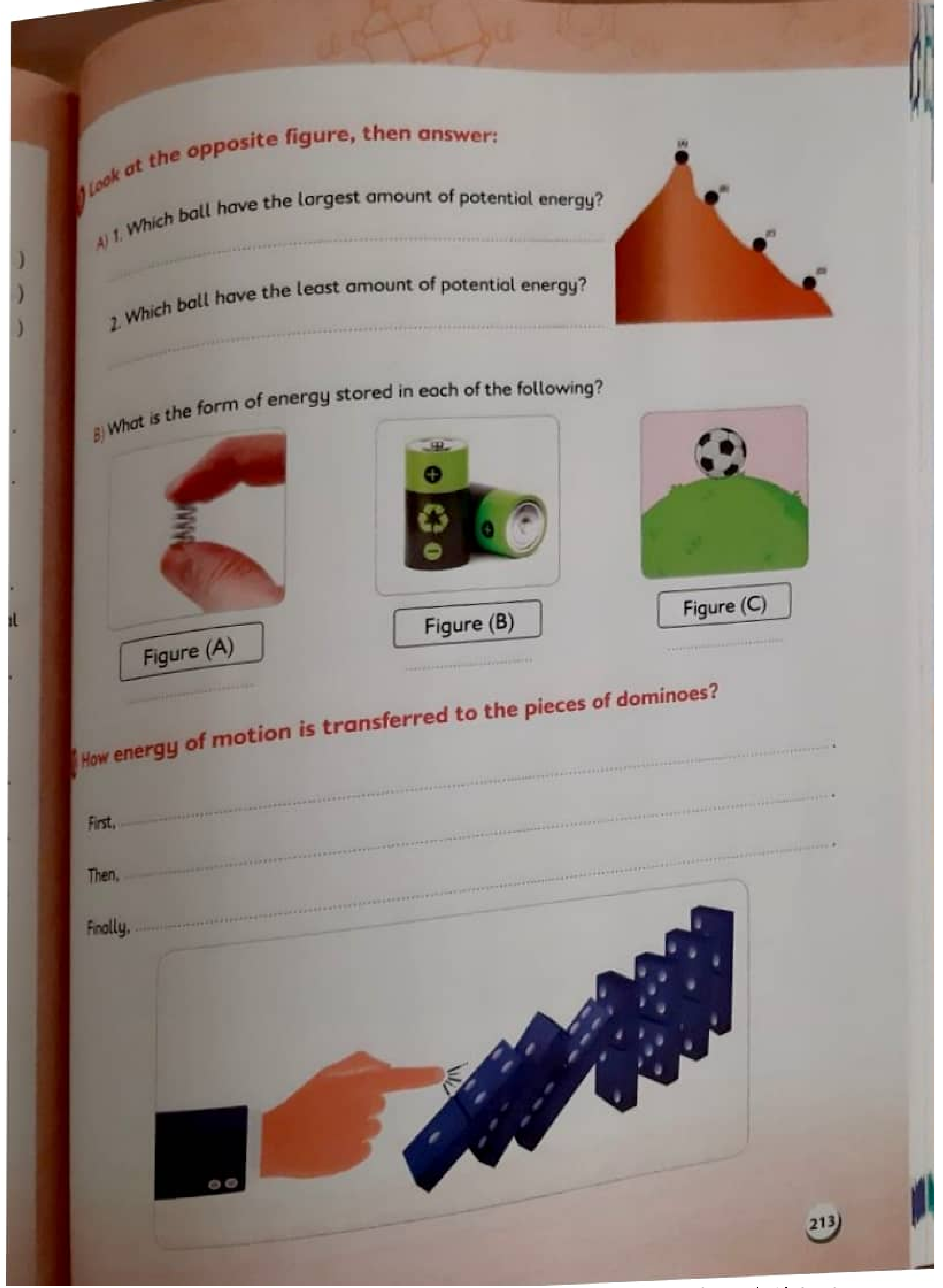
B) What

10 How en

First,

Then,

Finally



Look at the opposite figure, then answer:

A) 1. Which ball have the largest amount of potential energy?

....

2. Which ball have the least amount of potential energy?

....

B) What is the form of energy stored in each of the following?

Figure (A)

....

Figure (B)

....

Figure (C)

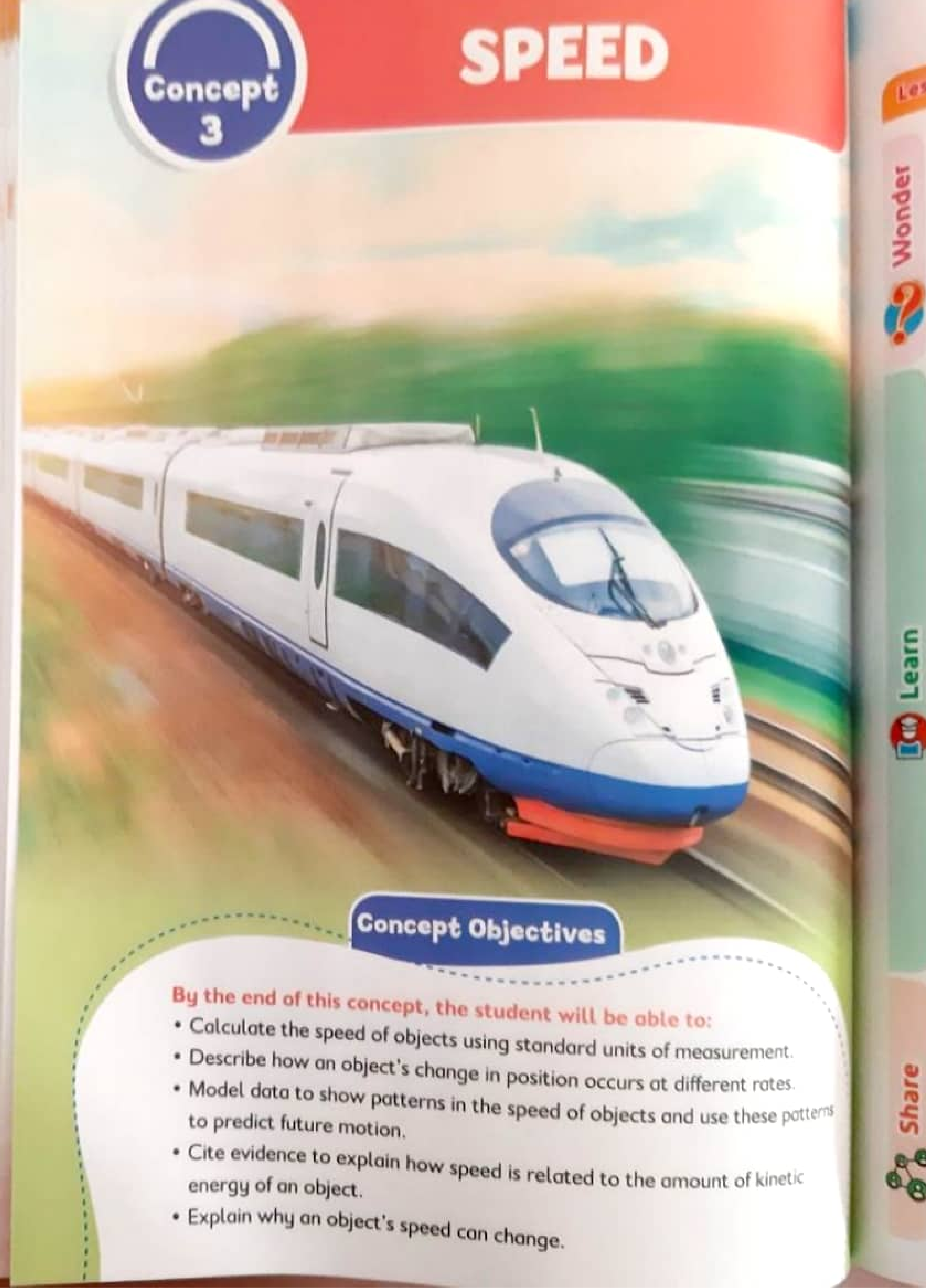
....

How energy of motion is transferred to the pieces of dominoes?

First, ...

Then, ...

Finally, ...



Concept 3

SPEED

Concept Objectives

By the end of this concept, the student will be able to:

- Calculate the speed of objects using standard units of measurement.
- Describe how an object's change in position occurs at different rates.
- Model data to show patterns in the speed of objects and use these patterns to predict future motion.
- Cite evidence to explain how speed is related to the amount of kinetic energy of an object.
- Explain why an object's speed can change.

"Pacing Guide"

Lesson	Activity	Key Terms	Life Skills
Wonder	**1 Can You Explain?** • Students begin to think about how they could measure the speed of a moving train.	Speed	Endurance
1	**2 Cheetah Speed** • Students ask questions about how much energy a cheetah possesses to run at top speeds.	Resistance	
	3 Objects Move at Different Speeds • Students observe an informal experiment to initiate their thinking about how speed can be measured.		
Learn 2	**4 Basics of Speed** • Students generate an explanation of speed based on evidence from the scientific text.		
	5 Measuring an Object's Motion • Students look for evidence to explain what information is necessary to make speed calculations.		Problem -Solving
3	**6 Hands-On Investigation: Measuring Speed** • Students work in groups to measure the speed of various balls traveling down a ramp.		Collaboration
4	**7 Calculating Speed** • Students apply mathematical and computational thinking to solve real-world problems and compare speeds using provided distance and time information.		Collaboration
	8 Hands-On Investigation: Racing Downhill • Students use model cars or trucks to measure the speed and kinetic energy of objects moving down inclines of various angles.	Angle of inclination	Accountability
	9 Changing Speed • Students use the information from a text about the relationship between speed and forces to construct an explanation for how to change a car's speed.	Fuel	
5	**11 Train Race** • Students analyze data about model trains to generate claims based on evidence from the data.		
Share	**12 Record Evidence: Cheetah Speed** • Students construct explanations to the Investigative Phenomenon "Cheetah Speed" and the "Can You Explain?" question or a question of their own.		
6	**13 STEM in Action: Solar Vehicles** • Students obtain information about solar vehicles to evaluate the use of solar energy related to the speed of solar vehicles.	Solar energy	
	14 Review: Speed • Students summarize their learning and apply it to the big ideas of the unit.		



WONDER

Lesson 1 ① Can You Explain?



Warm-up

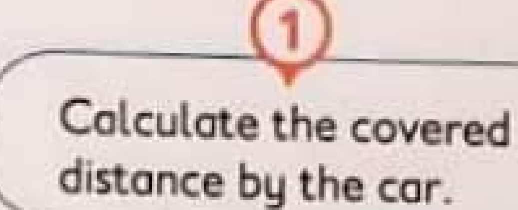
- If you want to travel to Aswan in a short time, which means of transportation will you choose?

The plane ☐ 

The train ☐ 

So,
- The plane covers a long distance in shorter time and flies at higher speed.
- The plane needs a lot of fuel to get a large amount of energy.

How do you measure the speed of a moving object?



① Calculate the covered distance by the car. →  → ② Calculate the time taken to cover this distance.

a moving car

So,

The measuring units of speed are:

- Kilometer per hour
- Meter per second

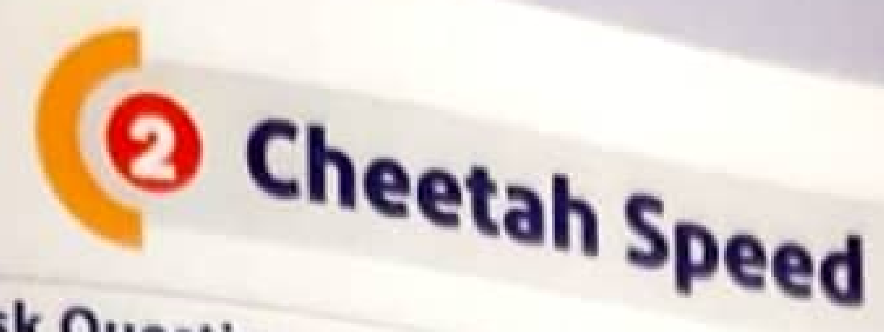
The high-speed train, which is faster than regular trains, will be soon used in Egypt.



Parents' Tips:

Help your child brainstorm by asking questions about speed like how can we measure it, and what is the relation between speed, energy and motion?





2 Cheetah Speed





Activity: Ask Questions Like a Scientist



Warm-up

We know that cars, trains, and other vehicles can move very fast, but what about animals?

- Put (✓) or (✗):
- All animals run at high speed. ( )

1 The super speed of cheetah:

- The fastest land animal on Earth is the cheetah which runs 100 meters in 6.4 seconds.

How fast is a cheetah?

Cheetah can go from zero speed to 96.5 kilometers per hour (kph) in three seconds and three strides, while a fast car does it in more than four seconds, and a high speed train can reach speed of 96.5 kilometers per hour in 37 seconds.

How is it possible for a cheetah to go so fast?

Cheetah has some special physical characteristics which make it fast and help it to survive as a predator.

1. Its head lows towards the shoulder to "cut off" decrease the air resistance.
2. It has large nose openings to breathe a lot of air.
3. It runs with its claws out to better push off the ground to be faster.
4. It has large, oversized powerful heart.
5. It has a flexible spine which acts as the spring of its legs' muscles.
6. It has light weight as the male cheetah weighs 41 kg to 45 kg.

Parents' Tips:

Help your child investigative, think and ask questions about phenomenon of the fastest land animal, the cheetah, and the characteristics that allow it to reach such speed.



WONDER



Conclude Like a Scientist

1. What is air resistance?

Answer: It is a force that results from the friction between air and the cheetah's body which works against its movement and decreases its speed.

2. How does cheetah overcome the air resistance?

Answer: It lows its head towards its shoulders to decrease the air resistance and increase its speed.



2 Cheetah's paws (claws) versus other cats:

- When we compare between the cheetah's claws and cats we found that:



Cat's claws



Cheetah's claws

- The cheetah's claws are larger than the claws of cats, as it depends on its claws when sticking them to the ground during running to be faster.



Apply Like a Scientist

(Answer Guide P. 9)

Complete the following using the given words:

(decreases - powerful - smaller - sticks)

1. Cheetah .... its claws in soil during running to be faster.
2. The cat's claws are .... than the cheetah's claws.
3. The air resistance .... the speed of cheetah.
4. Cheetah has an oversized .... heart.



3 Objects Move at Different Speeds

Activity: Observe Like a Scientist

Warm-up

- In the 50-meter swimming competitions, who gets the golden metal?

a. Those who take longer time. ☐

b. Those who take shorter time. ☐



The relation between speed, time and distance:

- Objects have different speeds when they cover the same distance at different time intervals.

Examples: Observe different moving bodies that cover different distances at the same time.

Which one is the fastest?

A racing car takes 4 minutes to cover a distance of 5333 meters.

A runner takes 4 minutes to cover a distance of 500 meters.

A running horse takes 4 minutes to cover a distance of 3200 meters.

A rocket takes 4 minutes to cover a distance of 384000 meters.

So,

The rocket has the highest speed because it covers the longest distance at the same time.

Apply Like a Scientist

(Answer Guide P. 9)

Write the factors needed to determine speed:

1. .... 2. ....



Parents' Tips:

Help your child observe different objects moving for a time set to relate time and distance to speed.

Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 10)

1 Choose the correct answer:

1. When the time taken to cover a certain distance decreases, the speed of this moving object ....
   a. remains at it is b. increases c. decreases
2. Cheetah's speed is .... a car's speed.
   a. less than b. the same as c. greater than

2 Complete using the given words:

(**decrease - same - slipping - Distance - high speed - time - longer**)

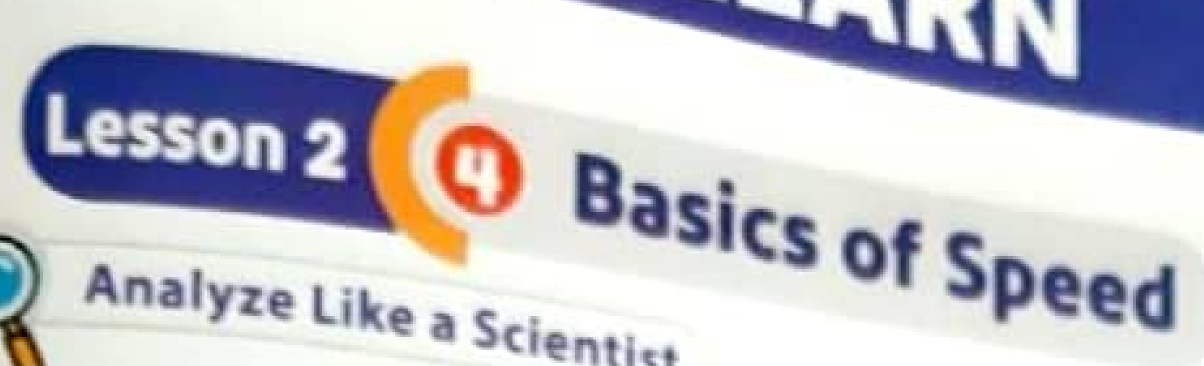
1. .... and .... help us measure the speed of a moving body.
2. We can run a .... distance than walking in the .... time interval.
3. Cheetah's head bows toward its shoulder to .... the air resistance.
4. Cheetahs stick their claws into the ground to protect them from .... during running at ....

3 Write «True» or «False»:

1. The light weight of the cheetah's body aids its speed. ( )
2. The cheetah has a big-sized heart. ( )
3. Time is the only factor affecting the speed of a moving body. ( )



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Lesson 2 (4) Basics of Speed

Activity: Analyze Like a Scientist

Warm-up



- Traffic jam slows down the speed of the vehicles making us arrive at work and schools late.



1 Calculating the speed of objects:

Definition

Speed:

- It is a physical quantity that indicates how fast a moving object is.
- It is the distance covered by a moving object within an interval of time.

Calculating the speed of the object: $\text{speed} = \frac{\text{distance}}{\text{time}}$

To calculate the value of speed:

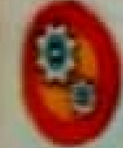
- Divide the distance covered by a moving object by the time taken to cover this distance.
- Use the mathematical rule

Speed= Distance/ Time

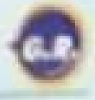
Some common units of speed:

Measuring units of speed

- Kilometer per hour (Km/h)
- Meter per second (m/s)



Conclude Like a Scientist

- **The motion direction of a body doesn't affect the value of speed.** 

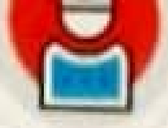
Answer:

If the moving object moves 5 meters backward or forward, the speed is still 5 meter/second.

Parents' Tips:

Help your child know the basics of speed and the factors needed to calculate speed to use it in comparing between the speed of moving objects.







2 Methods for comparing the speed of moving objects:

1. Observe the speed of objects that cover different distances at the same time.
2. Observe the speed of objects that cover the same distances at different periods of time.

Explore the relation between speed and distance:

- Comparing the speed of different objects that cover different distances at the same time = 2 seconds

Moving objects	The covered distance	The time taken	Speed
Object 1	10 meters	2 seconds	5 m/s
Object 2	20 meters	2 seconds	10 m/s
Object 3	30 meters	2 seconds	15 m/s

Object number 3 has the highest speed.

So, the object that covers a longer distance at the same period of time has greater speed.

Explore the relation between speed and time:

- Comparing the speed of different objects that cover the distance = 1000 m at different periods of time.

Moving objects	The distance covered	The time taken	Speed
Object 1	1000 m	50 seconds	20 m/s
Object 2	1000 m	100 seconds	10 m/s
Object 3	1000 m	200 seconds	5 m/s

Object number 1 has the highest speed.

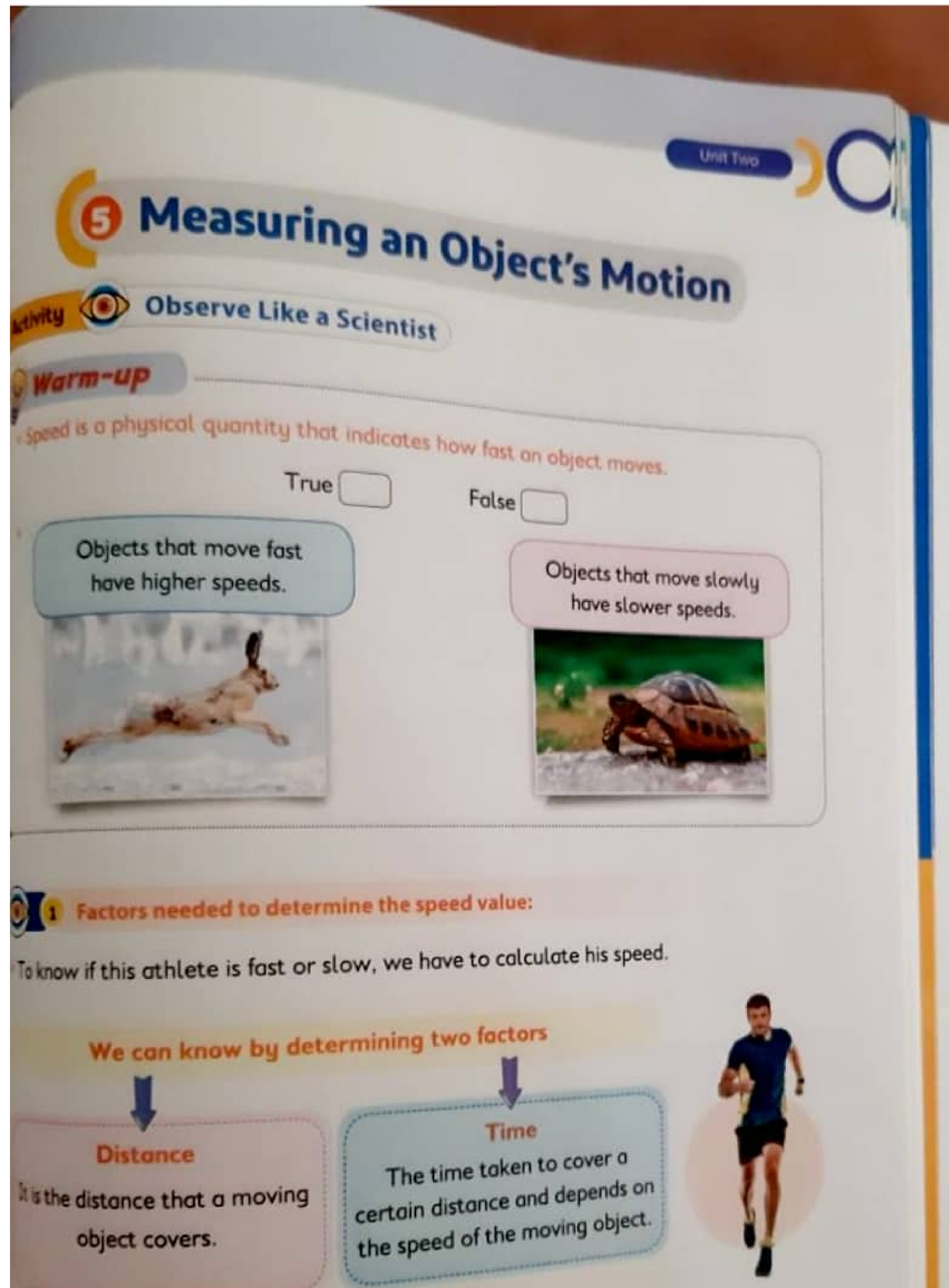
So, the object that takes shorter period of time has greater speed.

Apply Like a Scientist

(Answer Guide P. 9)

A traffic sign in a high way road is 80 kilometers per hour. Two cars are on the way, one covers 100 kilometers per hour but the other one covers 70 kilometers per hour. Which one moves with higher speed and exceeds the speed limit?





5 Measuring an Object's Motion

Activity: Observe Like a Scientist

Warm-up

• Speed is a physical quantity that indicates how fast an object moves.

True ☐ False ☐

Objects that move fast have higher speeds.

Objects that move slowly have slower speeds.

1 Factors needed to determine the speed value:

To know if this athlete is fast or slow, we have to calculate his speed.

We can know by determining two factors

Distance

It is the distance that a moving object covers.

Time

The time taken to cover a certain distance and depends on the speed of the moving object.

Parents' Tips:

... moving objects using the mathematical rule to get accurate speed calculations.





- **Follow the following steps to measure the speed of objects mathematically:**
  1. Determine the covered distance (it is measured by kilometer or meter).
  2. Determine the time taken (it is measured by hour or second).
  3. Divide the distance by the time.

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

meter per second (m/s)

kilometer per hour (km/h)

1 kilometer = 1000 meters

1 hour = 60 seconds

Examples:

1- Calculate the speed of a car that moves 300 km in 3 hours.

Answer

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{300}{3} = 100 \text{ km/h}$$

2- Calculate the speed of a boy who walks 600 meters in 60 seconds to reach school.

Answer

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{600}{60} = 10 \text{ m/s}$$

Apply Like a Scientist

(Answer Guide P. 9)

A. Calculate the speed of a truck that covers 600 kilometers in 5 hours.

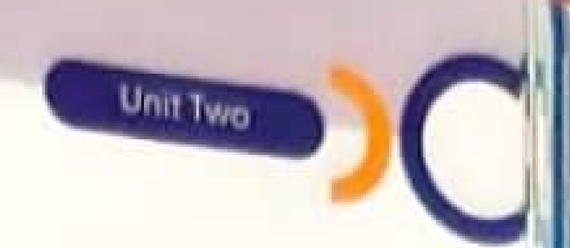
....

....

B. If it takes a fast athlete about 10 seconds to record a 100-meter sprint, calculate the speed of this athlete.

....

....



Lesson 3 ⑥ Hands-On Investigation: Measuring Speed

Activity: Investigate Like a Scientist

Warm-up

- If two objects have different masses, and the applied force on both is the same, which one will move faster and for a longer distance?

☐ 50-kg kid on a skateboard

☐ 35-kg kid on a skateboard



Measuring speed

- To measure the speed of a moving object, let's conduct the following experiment.



Aim: Calculate the speed of moving objects

Materials: 3 balls of different masses (The green ball is the heaviest then the red and the yellow ball respectively)-30 cm ramp books - stopwatch - measuring ruler or tape - masking tape

Procedures	Illustration	Observation
1 Prepare an inclined surface using books. 2 Measure a distance of one meter from the end of the ramp and then place a masking tape on the ground at the finish line.		
3 Roll the three balls by the same force from the top of the ramp, each ball separately, then record the time when each ball passes the finish line. 4 Increase the ramp and roll the three balls, then record the time.		• The yellow ball is faster than the red ball, and the red ball is faster than the green ball. • The speed of the ball increases by increasing the ramp inclination.

Parents' Tips:

Help your child calculate speed of different moving objects and observe how the mass of an object and the angle of inclination of a surface affects its speed.





LEARN

Conclusion

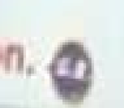
- By increasing the force applied on the ball, its speed increases.
- By increasing the ramp inclination, the speed increases.

Factors affecting the speed of moving objects:

- The force applied on the object.
- The type of surface and its inclination.



Conclude Like a Scientist

The speed of a moving object changes by changing the angle of inclination. 

Answer:

Because by increasing the angle of inclination, the speed increases and vice versa.

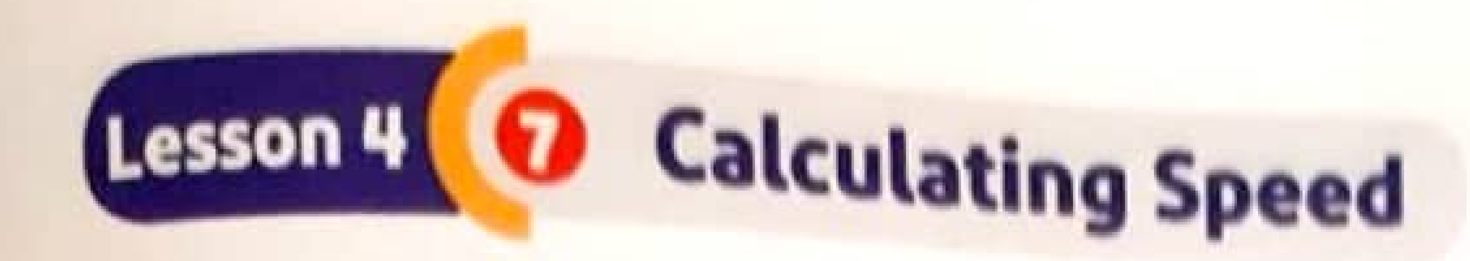
Apply Like a Scientist

(Answer Guide P. 10)



True or false:

1. When the inclination of a ramp increases, the speed of a moving object decreases. (..................)
2. The speed of a moving object of mass 100 Kg is more than the speed of an object whose mass is 5 Kg, when they are affected by the same force. (..................)
3. The mass of a moving object affects its speed. (..................)



Lesson 4 7 Calculating Speed




Activity: Analyze Like a Scientist

Warm-up

- The speed is calculated according to the mathematical rule which is speed = ...
- The unit of speed is ....

1 Calculating Speed

- By determining the value of distance and time, we can calculate the speed of any moving object.

Examples:

1. If the yellow car covers 15 meters in 3 seconds, calculate its speed.

Answer

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{15}{3} = 5 \text{ m/s}$$

2. If the green car covers 24 meters in 3 seconds, calculate its speed.



Answer

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{24}{3} = 8 \text{ m/s}$$

- Which car moves faster?



☐ The yellow car



☐ The green car

Parents' Tips:

Help your child analyze the data in a story problem to calculate the speed and compare values.





LEARN



2 Compare the speed values:

- We can use another way to compare the speed, by observing the distance covered by each car within the same time interval.

Compare the speed of the two cars

Yellow car	Green car
Covers 15 meters in 3 seconds	Covers 24 meters in 3 seconds

- Which car covers a longer distance? ☐ The yellow car ☐ The green car



3 Which one is the fastest?

- Calculate the speed value in each of the following cases, then answer why this case is the fastest.

1. Sally walks to her school a distance of 3 kilometers per hour. What is her speed?

Answer

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{3}{1} = 3 \text{ km/h}$$

2. Amr walks to his school, a distance of 5 kilometers per hour. What is his speed?

Answer

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{\cdots}{\cdots} = \cdots \text{ km/h}$$

3. Nada walks to her school a distance of 20 kilometers in two hours. What is her speed?

Answer

$$\text{Speed} = \frac{\text{distance}}{\text{time}} = \frac{\cdots}{2} = \cdots \text{ km/h}$$

So, Case number .... is the fastest, because (he/she) covers a (longer/shorter) distance in a (longer/shorter) time.

Apply Like a Scientist

(Answer Guide P. 10)

- Complete the following story problem to create your own one, then answer it:

A truck moves .... kilometers along the highway carrying a carriage of about 100 kilograms, within .... hours. Calculate the speed of the truck.

Answer

$$\text{Speed} = \frac{\cdots\cdots}{\text{time}} = \frac{\cdots}{\cdots} = \cdots \text{ km/h}$$

8 Hands-On Investigation: Racing Downhill



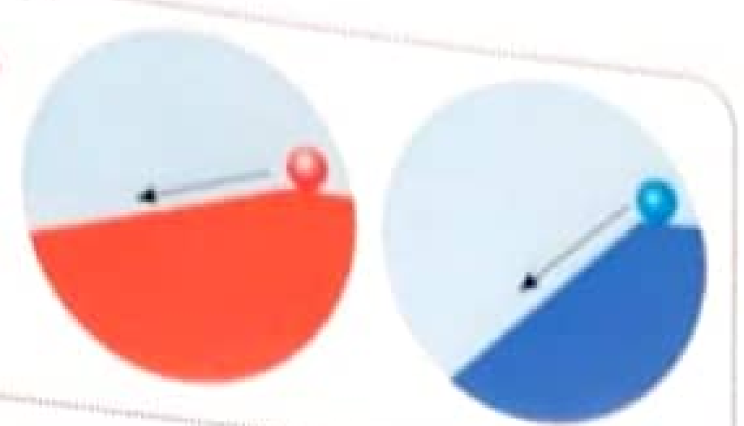
Activity: Investigate Like a Scientist

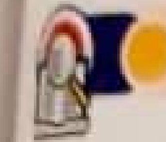
Warm-up

- When the two balls fall together, which one do you expect reaches the end of the ramp first?

☐ Red ball ☐ Blue ball







The relation between speed and kinetic energy:

- All moving objects have kinetic energy, do you think that the kinetic energy depends on the speed of a moving body?
- To answer this question, let's conduct the following experiment.

Activity

Aim: Show the relation between the speed and the kinetic energy of a moving object.

Materials: Books - measuring ruler - removable adhesive strips - stopwatch - toy truck - cardboard tube - paper cup - scissors

Procedures	Illustration	Observation
1 Record the number of books used, which represent the angle of the inclined surface. 2 Roll the truck down the tube, record the time it takes to reach the end of the tube using the stopwatch.		• The truck moves for a certain distance in a specific time.

Parents' Tips:

Help your child investigate the relation between speed, kinetic energy and surface inclination through performing an experiment.



LEARN

3 Repeat step (3), but increase the number of books to increase the inclination and put the paper cup at the end of the tube.



- The truck moves for a longer distance and hits the paper cup for a certain distance which increases by increasing the inclination.

Explanation

- By increasing the number of books, the speed of the truck increases, and the distance the cup moves increases.
- By increasing the angle of inclination of the surface, the speed of the truck increases and the kinetic energy increases.

Conclusion

- The speed of the body and its kinetic energy increase when the angle of inclination of the surface increases.
- The kinetic energy of a body is related to its speed, so as the speed increases the kinetic energy increases and vice versa.
- There is a direct relation between the speed and the kinetic energy. "The kinetic energy can be used to measure speed and vice versa."



Conclude Like a Scientist

1. Kinetic energy will change with the angle of the tube.

Answer: Because the steeper the incline, the more kinetic energy the truck will have.

2. Motion of the cup measures kinetic energy.

Answer: As farther the cup moves after the truck rolls into it, the more kinetic energy the truck has.



Apply Like a Scientist

(Answer Guide P. 10)

Fill in the blanks:

increases - decreases - direct - indirect - speed - time

1. When the surface inclination increases, the speed of the moving object ....
2. There is a/an .... relation between the speed and the kinetic energy.
3. When the .... decreases, the kinetic energy decreases



Lesson 5 (9) Changing Speed

Activity: Analyze Like a Scientist

Warm-up

- When you ride a car then it moves, does the car speed remain constant along the road?

Yes ☐ No ☐

- Sometimes a moving car moves with slow speed, sometimes with high speed and sometimes stop along the same road. What could affect its speed and motion?

1 Speed change:

- Force causes the movement of objects and changes their speed.
- To increase the speed of a moving body, we have to increase the applied force on it, and vice versa.
- The speed of a moving object and the kinetic energy depend on the forces acting on it.

Increasing Force --Increases--> Speed --Increases--> Kinetic energy

2 How does the car speed change?

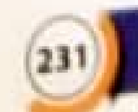
1 When the driver presses on the gas pedal:

- The engine is supplied with more fuel.
- Engine converts more potential energy into kinetic energy.
- The wheels move faster, so the car speed increases.



Parents' Tips:

Help your child know how the car speeds up or slows down by the effect of the force applied on the vehicle and analyze the energy conversion.



2 When the driver presses on the gas pedal slightly:



- The engine is supplied with less fuel.
- The car slows down due to the effect of friction.

3 When the driver takes his feet off the gas pedal:



- Due to the friction force between the car wheels and the ground.
- The car speed slows down.

4 When the driver presses on the brakes pedal:



- The friction force increases between the brakes and the wheels.
- The car speed slows down until it stops.

Apply Like a Scientist

(Answer Guide P. 10)



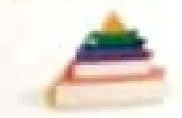
Put (✓) or (✗):

1. By pressing slightly on the gas pedal, the car stops immediately. ☐
2. Car brakes stop the car, due to the friction force between them and the wheels. ☐
3. By increasing the force, the kinetic energy of a moving object decreases. ☐
4. When the kinetic energy of a moving object increases, its speed increases. ☐

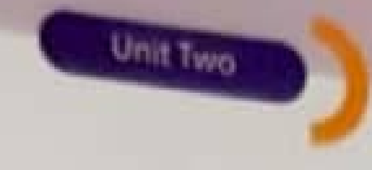
10 Optional Digital Activity

RC Racing Car

For more knowledge about the racing cars, their high speed and their structure, use the Egyptian Knowledge Bank.



Egyptian Knowledge Bank
بنك المعرفة المصري
https://study.ekb.eg





Train Race



Activity: Evaluate Like a Scientist

Warm-up

- If you know that two objects are moving, the first travels 6 meters in one second, and the second travels 8 meters in two seconds.

Which one is faster?

The first object ☐ The second object ☐







Which train is faster?

- Your friend Ahmed wants to buy a toy train. He has two trains to choose from.
- The train catalog gives the speed for the new train, it travels 4 meters in 8 seconds, and the second travels 3 meters in 12 seconds.
- **Help Ahmed choose the fastest train.**
- To help Ahmed, calculate the speed of each, then choose the fastest train.

First Train	Second Train
▸ Distance = 4 meters	▸ Distance = 3 meters
▸ Time = 8 seconds	▸ Time = 12 seconds
Speed $= \frac{\text{distance}}{\text{time}} = \frac{4}{8} = \frac{1}{2}$ meter/second	Speed $= \frac{\text{distance}}{\text{time}} = \frac{3}{12} = \frac{1}{4}$ meter/second

So, the speed of the first train is .... than the speed of the second train.

- **I advise Ahmed to buy the** .... **train.**



Parents' Tips:

Help your child check his/her understanding and apply what he/she has learned about speed to a life situation.



Al-Adwaa Exercises on Learn Activities

(Answer Guide P. 10)

1 Choose the correct answer:

1. Speed formula = ...
   a. distance x time   b. $\frac{\text{time}}{\text{distance}}$ c. $\frac{\text{distance}}{\text{time}}$
2. Which moving object has the slowest speed? ....
   a. 120 km/hour   b. 120 km/50 minutes   c. 120 km/2 hours
3. The kinetic energy .... when the angle of the inclined surface increases.
   a. increases   b. decreases   c. remains constant
4. What is the speed of a car that travels 450 kilometers in 5 hours? ....
   a. 90 km/min   b. 90 km/h   c. 90 m/h
5. Which statement describes the relation between speed and time?
   a. The higher the speed of a body, the smaller the distance it travels in a given time.
   b. The faster an object is, the less time it takes to travel a certain distance.
   c. The speed of a body increases when the time taken to cover the distance increases.

2 Write the scientific term for each of the following:

1. The length of the path covered by a moving body. (..........)
2. It is a physical quantity that refers to how fast an object is moving. (..........)

3 If the distance between two cities is 144 km and it takes 3 hours to travel between these two cities, what is the speed taken by the vehicle used during the trip?

....

....

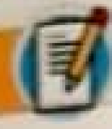
....





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12 Record Evidence: Cheetah Speed

Record Evidence Like a Scientist

Definition

Speed:
It is a physical quantity that indicates how fast a moving object is, and measures the distance covered by a moving object within an interval of time.

Now, act like a scientist by following the scientific method to review an idea:

How can you measure the speed of something moving fast?

Claim:

The speed of any moving object can be calculated.

Evidence:

We could calculate the speed of a moving object by finding the distance it covers and how long it takes to cover this distance. If we know these two things, so we will be able to measure how fast the moving object is going.

Scientific Explanation

To calculate the speed of a moving object:

1. Determine the covered distance (it is measured by kilometer or meter).
2. Determine the time taken to cover this distance (it is measured by hour or second).
3. Divide the distance by the time.

- When an object covers a long distance in a short time, then its speed is fast and vice versa.
- Measuring Units of Speed: Meter per second Kilometer per Hour
- The two factors needed to determine the speed: Distance Time

Factors that affect speed:

1. Object's mass (By increasing the object's mass, the speed decreases and vice versa).
2. Angle of surface inclination (By increasing the angle of inclination, the speed increases and vice versa).

Parents' Tips:

Let your child revise what he/she has learned throughout the concept about the basics of speed, its calculation and the relation between speed and kinetic energy. Write explanation with evidence about the cheetah's speed.



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- Now, act like a scientist by following the scientific method to review an idea:

Claim:

Cheetah's body structural adaptations allow it to be the fastest land animal and survive as a predator.

Evidence:

Cheetah covers 100 meters distance in nearly 10 seconds, so its speed is 10 m/s.

Scientific Explanation



- It lows its head near its shoulder to decrease the air resistance so its speed increases.
- Over-sized, powerful heart and wide nose openings to breathe more.
- Its claws stick to the ground during running to be faster.
- It is has a light weight body.
- It has a flexible spine (backbone) that acts as a spring for the leg muscles.

- **The relationship between speed and kinetic energy:**
  - The relationship between speed and kinetic energy is a direct relationship.
  - As the speed of a moving object increases, its kinetic energy increases and vice versa.

The effect of force on the speed of a moving body:

- As the applied force on a moving object increases, its speed increases so its kinetic energy increases.



Lesson 6 (13) STEM in Action

Solar Vehicles



Activity: Analyze Like a Scientist

1 Vehicles and fuel:

- Many mechanical engineers think about how energy can be used to power cars in creative ways.
- Some cars operate using fuel and some operate using electricity, but these cars have disadvantages.

Disadvantages of fuel-powered cars:	Disadvantages of electric cars:
It requires going to the gas station that affects climate change.	They contain batteries that must be charged.





2 Solar Vehicles

Can you imagine a car that never stops due to gasoline or charging?

- Mechanical engineers design vehicles that are operated by using solar energy only.
- They are trying to make solar vehicles that can be driven as quickly as conventional vehicles.
- Among their trials, they reduce the weight of the car and other effective changes.

Do solar vehicles have advantages and disadvantages?

Advantages of using this car

- Don't need fuel.
- Don't need to charge.
- Don't cause climate change.

Disadvantages of using this car

- The amount of energy from the sun is not as great as the amount of energy we get from gasoline or electricity.

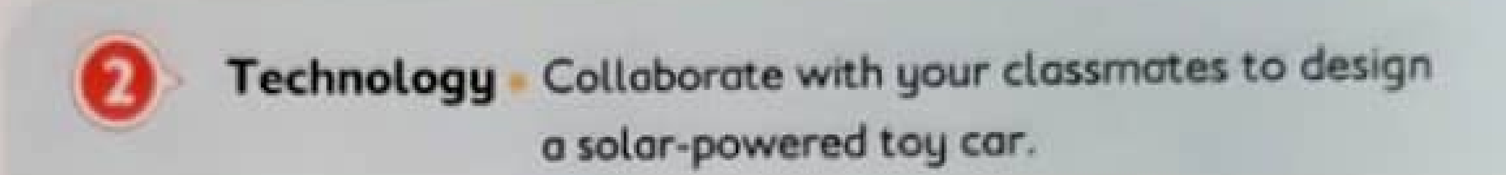






- The solar car is so lightweight that it dispenses with most of the devices used in the car, such as the speedometer, so we can't measure its speed.
- After you have learned more about speed, the factors that affect it, and how to be calculated, how can you calculate the speed of a car powered by solar energy without a speedometer?

1 Science ▪ Do research about solar cells and the energy transformations that occur in them.





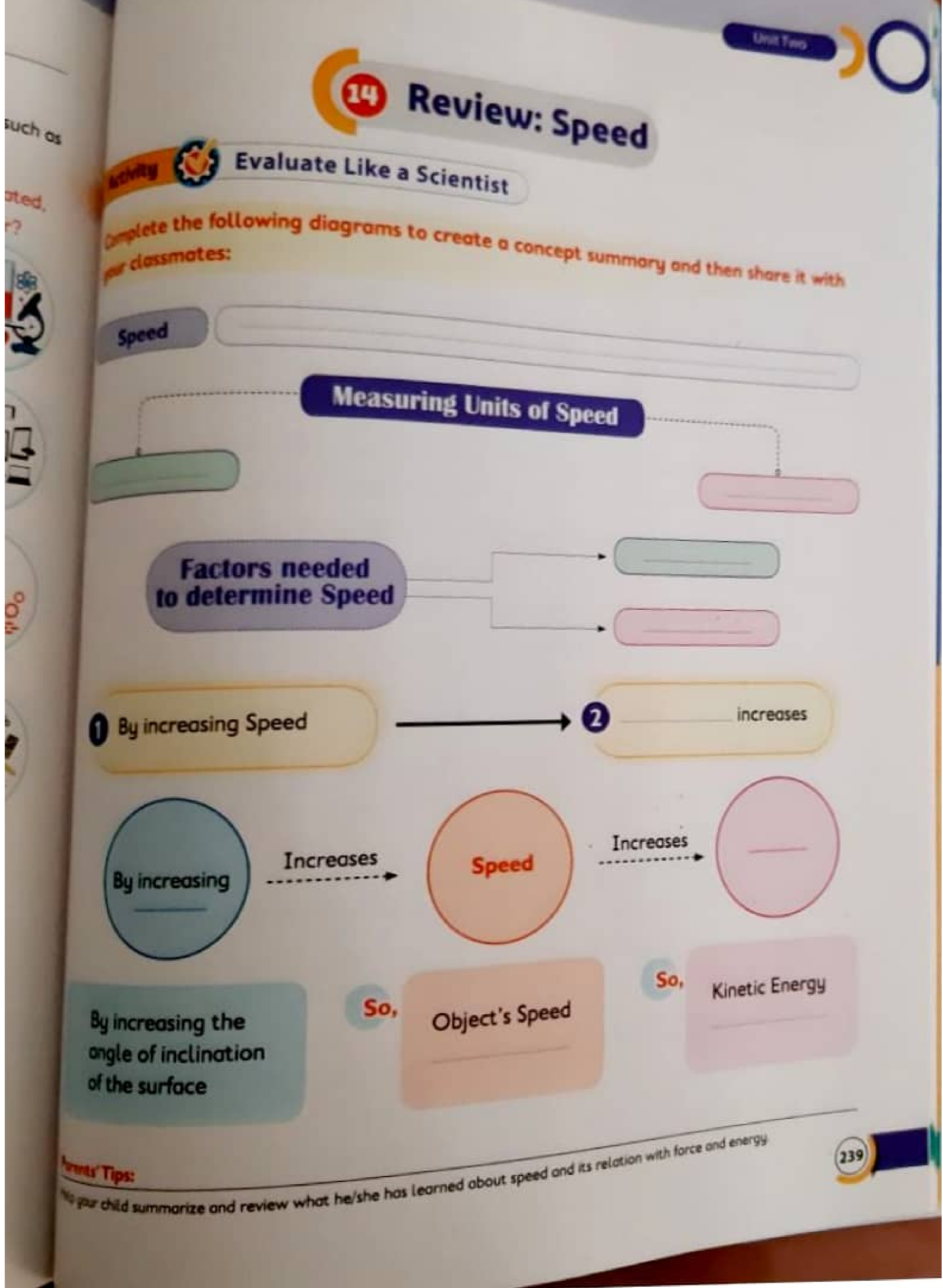
2 Technology ▪ Collaborate with your classmates to design a solar-powered toy car.



3 Engineering ▪ Do research about the optimal design of cars that increase their speed and minimize fuel consumption and resistance.

4 Mathematics

- First, we need to know the time and distance.
- Put two marks between them, a known distance in the path in which the car is moving.
- Record the time taken for the car to pass between the two specified marks.
- Divide the distance covered between the two marks by the time you recorded to get the speed.


Unit Two
14 Review: Speed
Activity
Evaluate Like a Scientist
Complete the following diagrams to create a concept summary and then share it with your classmates:
Speed
Measuring Units of Speed
Factors needed to determine Speed
1 By increasing Speed
2 increases
By increasing
Increases
Speed
Increases
By increasing the angle of inclination of the surface
So, Object's Speed
So, Kinetic Energy
Parents' Tips:
Help your child summarize and review what he/she has learned about speed and its relation with force and energy
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Al-Adwaa Exercises on Concept 3

(Answer Guide P. 10)

1 Choose the correct answer:

1. As the car's speed increases, its kinetic energy ....
   - a. decreases
   - b. doesn't change
   - c. increases
   - d. No correct answer
2. The more you press (push) the gas pedal, the car's engine ....
   - a. decreases the speed
   - b. stops
   - c. increases the speed
   - d. keeps the speed constant
3. All the following are measuring units of speed except ....
   - a. meter/second (m/s)
   - b. meter/kilometer (m/km)
   - c. kilometer/hour (km/hr)
   - d. No correct answer
4. The kinetic energy of a toy truck is .... the kinetic energy of a real car.
   - a. less than
   - b. as same as
   - c. greater than
   - d. No correct answer
5. .... is the rate of change of distance per unit time.
   - a. Kilometers
   - b. Hours
   - c. Speed
   - d. Meters
6. In a race between a rabbit and a tortoise, the rabbit ran a greater distance than the tortoise, what races will the rabbit win if both move at the same time from the starting line? ....
   - a. Short distance races but not the long ones.
   - b. Won't win any race.
   - c. Long distance races but not the short ones.
   - d. All races.
7. How can we calculate Speed? ....
   - a. $\frac{\text{Time}}{\text{Distance}}$
   - b. $\frac{\text{Distance}}{\text{Time}}$
   - c. $\frac{\text{Mass}}{\text{Time}}$
   - d. $\frac{\text{Distance}}{\text{mass}}$

8. Maha's is walking over an inclined road surface, and her mother pushed her. How the pushing force applied on Maha will affect her direction of motion? ....

a. The push increased her speed.
b. The push stopped her motion.
c. The push decreased her speed.
d. The push didn't affect her speed.

9. Which of the following describes the relation between the speed and time? ....

a. As the speed of an object increases, the distance travelled in specific time will decrease.
b. The speed of an object is equivalent to the time taken to cover specific distance.
c. As the speed of an object increases, the time taken to cover specific distance will decrease.
d. The speed of an object decreases, when the time taken to cover specific distance increases.

10. In the pool, Youssif was paddling backwards in his boat, and Hisham was behind swimming toward the boat, then he started to push the boat. What is the effect of the pushing force on the boat's motion? ....

a. The push increased the boat's speed.
b. The push stopped the boat's motion.
c. The push decreased the boat's speed.
d. The push didn't affect the boat's speed.

Look at the following figures, then answer:



Figure (A)

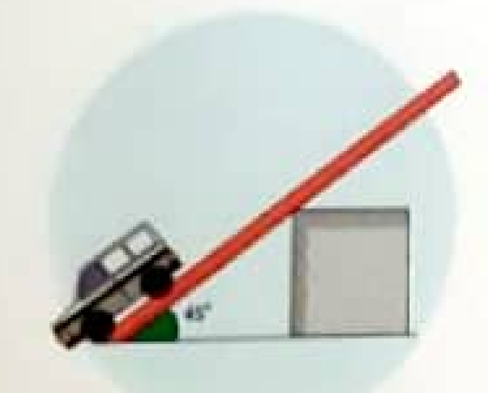


Figure (B)



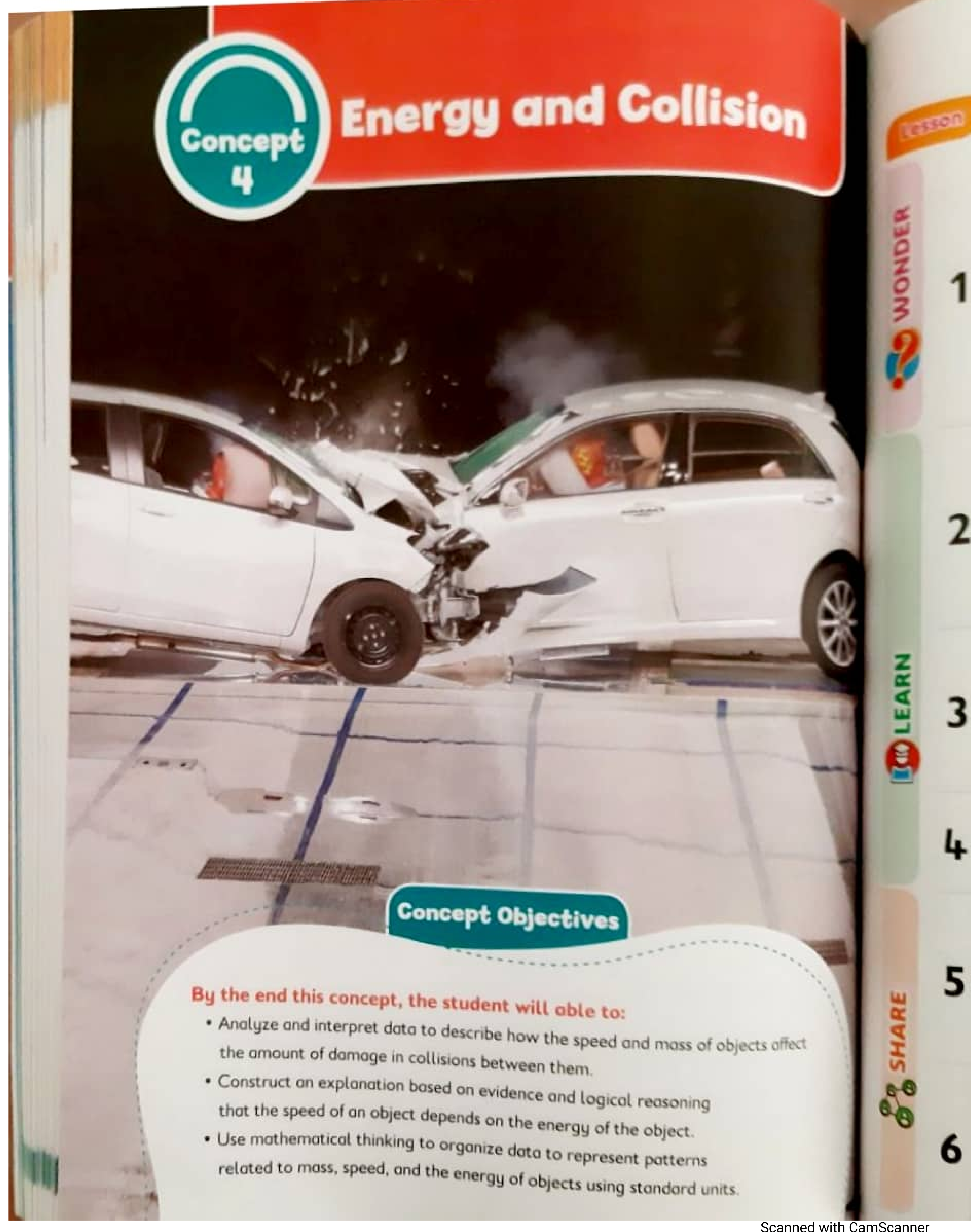
Figure (C)

1. Which figure shows the highest kinetic energy?
....

2. Which figure shows the least kinetic energy?
....

3. Arrange the 3 figures regarding to their speeds from the highest to the lowest.
....

4. As the angle of inclination decreases, the speed .... and the kinetic energy ....



Energy and Collision

Concept Objectives

By the end this concept, the student will able to:

- Analyze and interpret data to describe how the speed and mass of objects affect the amount of damage in collisions between them.
- Construct an explanation based on evidence and logical reasoning that the speed of an object depends on the energy of the object.
- Use mathematical thinking to organize data to represent patterns related to mass, speed, and the energy of objects using standard units.

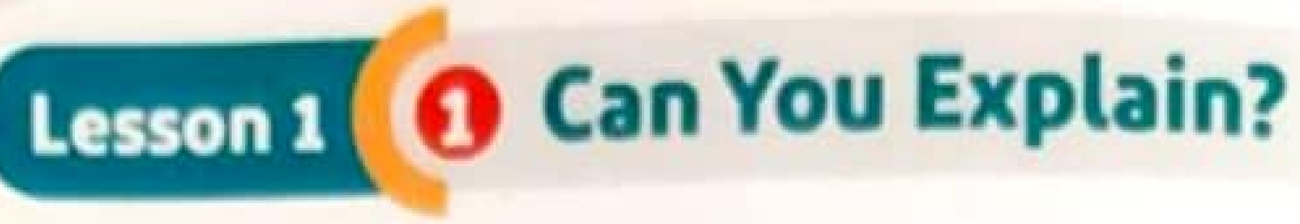
"Pacing Guide"

Lesson	Activity	Key Terms	Life Skills
1	**1 Can You Explain?** • Students begin to construct explanations about what happens to energy during collisions.	Wrecking ball	The student can share ideas.
	2 Collision • Students examine the game of cricket, make observations and ask questions about changing variables in the ball and bat system.	Cricket game	The student can analyze situations.
	3 Watching Objects Collide • Students obtain evidence from text and media to explain the cause-and-effect relationship between collisions and transfer or change of energy also examine the role of airbags in keeping passengers safe.	Seatbelts Airbags	The student can identify problems.
2	**4 Energy and Collisions** • Students obtain information from a text to draw a model describing how the kinetic energy of colliding objects changes before and after a collision.	Collision	———
	5 The Effect of Speed on Collisions • Students use a text to analyze and look for patterns in kinetic energy and speed data collected in the Hands-On investigation Racing Downhill.	———	———
3	**6 Hands-On Investigation : Speed and Collisions.** • Students build on their understanding of speed from the previous concepts Hands-on investigation Racing Downhill.	———	The student can think about how their teams work together.
	7 The Effect of Mass on Collisions • Students analyze a text to explain how the mass of moving objects can affect the amount of kinetic energy in a collision.	Mass	———
4	**8 Hands-On Investigation :Mass in Collisions** • Students use evidence obtained to engage in arguments about the relationship between the mass and both the speed and kinetic energy of objects.	———	The student can think about how their teams work together.
5	**9 Energy Conversions during a Collision** • Students identify the transfer of energy in a Newton's cradle by reading a scientific text, watching a video and discussing with peers.	Newton's Cradle	———
	10 Record Evidence: Collision • Students construct a scientific explanation about the investigative phenomenon collision and" Can you explain?" question.	———	The student can apply an idea in a new way.
6	**11 STEM in Action** • Students simulate crash investigators work by analyzing images of different car crash scenarios.	Crash Investigator Crash Scene	———
	12 Review: Energy and Collision • Students will summarize their learning and apply it to the big ideas of the unit.	———	———

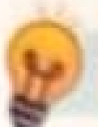
WONDER
LEARN
SHARE



WONDER



Lesson 1 ① Can You Explain?



Warm-up

- What happens when a car collides with a tree trunk?

The car is crashed. ☐ The car is not affected. ☐

When two objects collide with each other, each object pushes or crashes the other.

Example:

- The wrecking ball: which knocks down buildings.
- Helps construction workers knock down walls or parts of building.



It is a heavy steel ball that swings on a cable.

What happens to objects when they collide with other objects?

When a fast train (heavy and has more energy) collides with a slow car (light and has less energy), the energy transfers from the train to the car causing its damage.



An object with more energy causes more damage than an object with low energy.
A heavier object causes more damage than a lighter object.

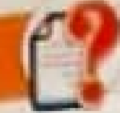
Parents' Tips:

Help your child to have an experience with a wrecking ball and also encourage him/her to think of other examples of collisions to activate their prior knowledge.





2 Collision

Activity: Ask Questions Like a Scientist

Warm-up

Look at the opposite figure, then tick the correct answer.

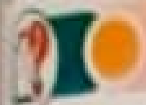


1. What happens to the tennis ball when it hits the racket?

☐ Speeds up ☐ Slows down

2. The ball moves .... after hitting the racket.

☐ in the same direction ☐ in the opposite direction



Collision in cricket:

- It is a world-popular game.
- The player uses a wooden bat or a stick to hit a ball.
- The cricket player stands with a bat and moves it as the ball approaches at high speed.
- The bat makes contact with the ball.



What happens to the energy from the moving bat to the moving ball?

1. The bat transfers its kinetic energy to the ball.



2. The speed of the ball increases in a different direction.

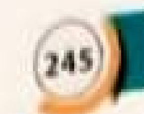
3. The collision impact makes a popping sound and the batter would feel the bat hitting the ball.

Apply Like a Scientist

(Answer Guide P. 10)

Put (✓) or (✗):

1. In cricket game, the energy is transferred from the ball to the bat ☐
2. When the bat hits the ball, its speed decreases. ☐



Parents' Tips:

Help your child examine the force between a bat and a ball when the bat hits the ball.



3 Watching Objects Collide



Observe Like a Scientist

Warm-up

- When you drive a car, then it stops suddenly, your body ....

 moves forward ☐ moves backward ☐

So, we need safety equipment in order to keep us in our places in case of car collisions.

- Objects that are in motion stay in motion until something stops them.
- We need safety equipment in case the car stops suddenly.

1 Cars Safety equipment:

1 Car seatbelts:

- They are used in cars to keep our bodies from moving forward.
- They have saved thousands of lives.



Parents' Tips:

Help your child consider how airbags and seatbelts in a car keep people safe from the force in a collision.



1) Air bag:

Its function

- Slows the speed of a person moving forward.
- Absorbs the energy of the car's impact.

Its composition and location

- Made from thin nylon material folded into the steering wheel, seat, dashboard or door.
- It is like a big pillow to land against during a crash.

How does it work?

A) During collision:

1. It inflates automatically when car sensors detect a crash.
2. The airbag fills with gas to provide a soft cushion.

B) After collision:

It deflates through its holes or vents, so we can get out of the car.

2 **Collision of cars and trains**



- Trains are much larger than cars, travels at high speed.
- As the speed and force of the collide objects increase, the damage and the dangerous increase as well.

Conclude Like a Scientist

1. Do airbags in cars protect people when they collide with trains? Yes ☑ No ☐
2. Does the car frame protect us in collisions? Yes ☑ No ☐
3. Do larger objects that are heavier cause more damage in a collision? Yes ☑ No ☐

Apply Like a Scientist

(Answer Guide P. 10)



Complete the following sentences

1. .... prevents our bodies from moving forward when a car stops suddenly.
2. Airbags are made of .... material.
3. When .... detect the car crash, the air bag inflates automatically.

Al-Adwaa Exercises on Wonder Activities

(Answer Guide P. 10)

1 Tick (✓) the correct answer:

1. During collisions, the energy transfers from ....
   - ☐ the body with higher energy and speed to the body with less energy and speed
   - ☐ the body with less energy and speed to the body with higher energy and speed
   - ☐ the body with higher energy and speed to itself.
2. What happens, when a car stops suddenly?
   - ☐ The passenger moves backward.
   - ☐ The passenger moves forward.
   - ☐ The passenger remains stable.

2 Complete using the given words:

(**Seatbelt - increases - small ball - airbag - tennis racket**)

1. When a tennis player hits the tennis ball with the tennis racket, the energy will transfer from the .... to the ....
2. During a car crash the .... inflates with gas automatically once the collision is detected by the car sensors.
3. .... prevents your body from moving forward.
4. The effect of collision increases when the speed of the body ....

3 Put (✓) or (✗):

1. When a truck hits a car, the energy transfers from the car damaging the truck. ( )
2. As the force of collision increases, the damage increases. ( )
3. Seatbelt is the only life saving system in cars. ( )
4. The collision between objects produces sound. ( )



LEARN





Lesson 2 (4) Energy and Collisions





Activity: Analyze Like a Scientist

Warm-up

What happens when your bike collides with an empty metal can?

- Tick the expected effect after the collision.

The metal box moves ☐ The bike speeds up ☐ The bike slows down ☐

Definition



Collision:

- It is the bumping or crashing of two objects into each other.



Collision and energy transfer

- When objects collide, the energy transfers between the collided bodies.

Example: A boy is running down the street hits a traffic sign.

1. The boy has a kinetic energy during running.
2. The kinetic energy of the boy will be transferred to the sign and the boy stops and bounces off.
3. Changes into kinetic energy may make the sign wobble a bit and rattle.

Potential energy that is stored in the sign.

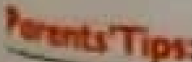
4. Some of the kinetic energy changes into sound energy.



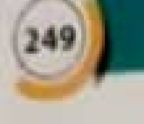
Conclude Like a Scientist



- When a cyclist collides with a bread cart, energy transfer occurs. Give reason.



Answer: Because the kinetic energy of the bike transfers to the cart and the bread, then the cart tips over and the bread scatters.



Parents' Tips:

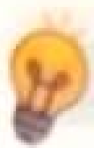
Help your child think about the transfer of kinetic energy from his/her body to objects he/she might commonly bump into.



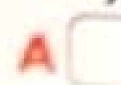
LEARN

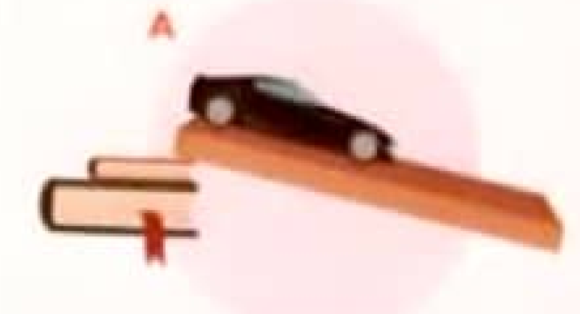
5 The Effect of Speed on Collisions

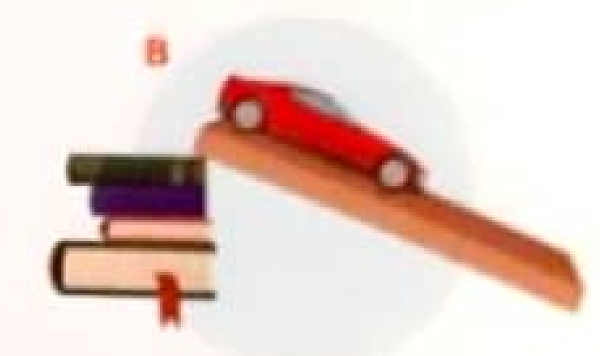
Activity  **Analyze Like a Scientist**



Warm-up

- We learned in the previous concept that the speed of an object changes with the change of the angle of inclination of the surface on which the objects move.
- From the following picture, which car moves faster? A  B 





The effect of the speed on collision:

- The amount of kinetic energy of an object depends on its speed, the faster an object travels, the more energy it has.



When a fast object hits another object.

Energy transfers to another object, some of the transferred energy is in the form of heat, light or sound.



The collided object.

Parents' Tips:

Help your child to apply what he/she knows about the speed and energy to consider the effects of these factors on collisions.

Example:

- A fast rubber ball makes a louder sound when it hits the racket than a slow ball.



G.R.
- **The transferred energy of some fast cars is in the form of light, sound or heat.**
Because of their extra energy, as the faster a given object is moving, the more energy it transfers..

- The difference between the fast object and slow object during collision.

Fast Objects	Slow Objects
▸ Have much energy When collision occurs, they exert more force and cause more damage (This force can smash a car fender or damage the car beyond repair).	▸ Have less energy When collision occurs, they exert less force and cause less damage compared to the fast objects.

What happens when moving objects increase their speed?

- If a car increases its speed, its kinetic energy increases.
- All this energy will result in a large force being exerted in an accident. This is the reason why driving fast is so hazardous.

Example:

- If two cars collided head-on with each other, then the force exerted in the accident depends on the combined speed of both cars.



Damage would be much more severe.

Apply Like a Scientist



(Answer Guide P. 10)

Choose the correct answer:

1. What happens when an object's speed increases?

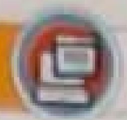
☐ Kinetic energy decreases ☐ Kinetic energy increases

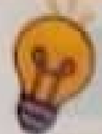
2. When the tennis ball hits the racket, part of its kinetic energy is converted into .... energy.

☐ light ☐ sound



Lesson 3 (6) Hands-On Investigation: Speed and Collisions

Activity  Investigate Like a Scientist



Warm-up

- You have learned, that the speed of an object affects its kinetic energy.
- But how force can affect both speed and kinetic energy.
- The greater the amount of force, the more kinetic energy the object will have.

Activity

Aim: Investigate the relation between the speed of objects and their kinetic energy in the collision

Materials: Modeling clay -Meterstick - Piece of cardboard

Procedures	Illustration	Observation
1 Roll a ball of clay in your hands (smoothing the side of it), then sketch the ball of clay.		- The ball shape changes slightly and becomes uneven after dropping it .
2 Use the cardboard to create a landing platform, attached to hard surface on the ground. Position the clay ball 1 meter above the platform.		
3 Open your fingers to drop the clay ball (not throw) onto the platform. sketch the dropped ball of clay in the table.		- The ball shape changes more and becomes uneven after throwing it with small force.
4 Smooth the clay ball over, increase the force of dropping and throw it at the platform from 1 meter above. Sketch the thrown ball lightly.		
5 Repeat on more time and throw the clay ball a bit harder at the platform. Sketch the result.		- The ball shape changes much more and becomes completely uneven after throwing it with more force.

Amount of Force Used	Sketch Clay
Dropped	
Thrown Lightly	
Thrown Hard	

Conclusion:

- The greater the speed of a moving object, the greater the kinetic energy in the collision.

Parents' Tips:

Help your child deepen his/her understanding of force and speed by investigating how these factors affect the amount of kinetic energy transferred in collision.



Conclude Like a Scientist

1- How are the results from this experiment different or similar compared to the results from the tests you did in racing downhill?

Answer

Similarities

- In both tests, there is the same relationship between speed and kinetic energy.

Differences

- This experiment examined how the speed and the force of an object affect how much of collision it has.
- While the other experiment measured how the speed changed with different inclines.

2- What does the damage of the clay ball tell you about what happens to vehicles in a real-world collision?

Answer

The faster a car is going, the more damage it will do when it hits something.

Apply Like a Scientist

(Answer Guide P. 10)



Tick (✓) the correct answer

What is the relationship between speed and kinetic energy?

- ☐ The greater the speed, the greater the kinetic energy.
- ☐ The greater the kinetic energy, the less the speed.
- ☐ There is no relationship.



LEARN

7 The effect of Mass on Collisions

Activity  Analyze Like a Scientist



Warm-up

- Do all vehicles you see on the road have the same mass?

  ☐ Yes ☐ No

- When a truck collides with a car, it causes ....

  ☐ more damage to the car ☐ more damage to the truck



1 The relation between the mass of an object and its kinetic energy (Comparing Trucks)

- The large truck has a greater mass than a car.
- Truck needs bigger engines than car.
- As each vehicle moves faster, the energy from the fuel which its engine uses is converted into kinetic energy.

The truck speed = 80 km/h



It consumes more fuel and gains more kinetic energy.

The car speed= 80 km/h



It consumes less fuel and gains less kinetic energy.

Parents' Tips:

Help your child explore the effect of mass on collision.

G.R.

- A 1-ton truck has half the kinetic energy of a 2-ton truck travelling at the same speed.
- Because, if the mass of an object doubles, its kinetic energy at a certain speed doubles.
- The big truck consumes more fuel than the car and gains more kinetic energy.

2 The Effect of mass on collision, continued

This is why a larger-mass vehicle causes more damage when it hits something than a small-mass vehicle traveling at the same speed.

Examples:

- A pedestrian colliding with different vehicles of the same speed.



If a pedestrian is hit by a bicycle with a speed of 50 kilometers per hour, he will most likely survive.



- If a pedestrian is hit by a car at the same speed of the bicycle, it may endanger his life.

Apply Like a Scientist

(Answer Guide P. 10)

A) Put (✓) or (X)

1. The mass of an object does not affect kinetic energy. ☐
2. Less fuel consumption in large-mass vehicles. ☐
3. Vehicles with large masses cause more damage in the case of collision. ☐

B) A bird and a plane traveling at the same speed which object has more kinetic energy.

Bird ☐ Plane ☐



Lesson 4 (8) Hands -On Investigation: Mass in Collisions

Activity Investigate Like a Scientist



- You have learned the relations between mass of object and its speed and its kinetic energy.

- The greater the mass of an object, the greater its speed.
- The greater the mass of a moving object, the greater its kinetic energy.

Activity

Aim: Explore How Does Mass affect Speed?

Materials: 3 toy cars - scale - metal washers - paper clips - coins- paper - books - 2 cardboard (for making a ramp) - tape-stopwatch - meterstick

Steps	Illustration
1 Tape washers or other weights to two of the three cars , adding different amounts of weight to each.	
2 Place one end of the cardboard ramp on two stacked textbooks.	
3 Calculate the mass of each car using the scale, then record their masses in the table below.	
4 Use a piece of tape to mark the finish line.	
5 Release the cars from the top of the ramp, one by one and record the time taken to reach the finish line.	

Parents'Tips:

Help your child connect what he/she has learned about the concepts of force, speed, mass, kinetic energy with the role they play in the outcomes of a collisions.



Car	Mass	Distance	Time	Speed
1		1 meter		
2		1 meter		
3		1 meter		



Observation:

- When the mass of the car increases, the time taken to cross the distance to the finish line decreases, and the speed of the moving object increases.
- Conclusion:-The speed of the moving object increases as its mass increases.

Activity

Aim: Measuring Kinetic Energy

Materials: a meter string - a paper cup - a toy car or light and heavy objects found in the classroom - a ruler – a pencil

Steps	Illustration
1 Tie one end of the string to a pencil and attach the lightest toy car to the other end.	
2 Place a paper cup on the floor in the path the car will swing, then mark the cup's starting location on the floor with a piece of tape.	
3 Hold the car straight out so that the cup is in the swinging path of the car.	
4 Release the car and let it collide with the cup.	
5 Mark where the cup moved to with a piece of tape and measure how far this is from the starting position.	
6 Repeat with heavier cars and record the results.	

Cars (From lightest to heaviest)	How many centimeters did the cup move?
1	
2	
3	



LEARN

Observation:

- The distance covered by the cup increases as the mass of the car increases.

Conclusion:

- The speed and kinetic energy of objects increase with the increase in their mass.



Conclude Like a Scientist

1- How are the results from this experiment different or similar compared to the results from the tests you did in racing downhill and speed and collisions?



The speed and kinetic energy both increase with increasing angle of inclination and increasing mass.
The objects we tested, angle of ramp, and mass are different which required different data.

2- What do your results tell you about vehicle collisions in the real world?



Vehicles with more mass have more kinetic energy at the same speeds than vehicles with less mass, they cause more damage in collisions.

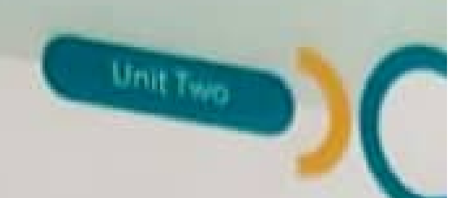
Apply Like a Scientist

(Answer Guide P. 10)

Complete the following:

1. The speed and kinetic energy of objects increase with the increase in ....
2. Large vehicles have .... kinetic energy compared to vehicles with less mass.





Lesson 5 (9) Energy Conversions during a Collision



Activity **Analyze Like a Scientist**



Warm-up

- When playing with marbles, how many times is the energy transferred to get the marbles out of the triangle (Tick the correct answer.)

2 times ☐ 3 times ☐ 4 times ☐



- When the marble collides with another marble to eject it from the triangle, we hear a sound which means **(Kinetic energy changes into sound energy)**



Energy conversion during a collision in Newton's cradle

When the pendulum ball is raised up, it stores a potential energy.



When the ball is left to move in the direction of the rest of balls, the potential energy decreases gradually and changes into kinetic energy.







When the ball collides the amount of the kinetic energy of the first ball transfers to the second ball during collision and successively reaches the last.



When the energy reaches the last ball, it moves with a kinetic energy equals to the kinetic energy of the first ball.

Parents' Tips:

Help your child deepen his/her understanding of energy in a collision by exploring a concrete demonstration of energy conversion.



LEARN

Explanation:

- When a collision occurs, the energy before collision is equal to the energy after collision and none of the energy disappears (most of the energy is transferred to other balls).
- so the number of balls moving on both sides of the pendulum is equal.

Some energy is lost into different forms in a Newton's cradle:

1. Changing some of the kinetic energy into sound energy.
2. Some energy is lost in the form of the friction between the string and other moving parts.
3. Some energy is lost when the balls pass through the air.



Note If we leave the cradle long enough, after lots of collisions, the moving balls lose their kinetic energy and stop.



Conclude Like a Scientist

- **If a car hits a stop sign, not all the energy transfers from the car to the sign.** 

Answer

Because, part of the energy is lost in the form of sound energy and thermal energy.

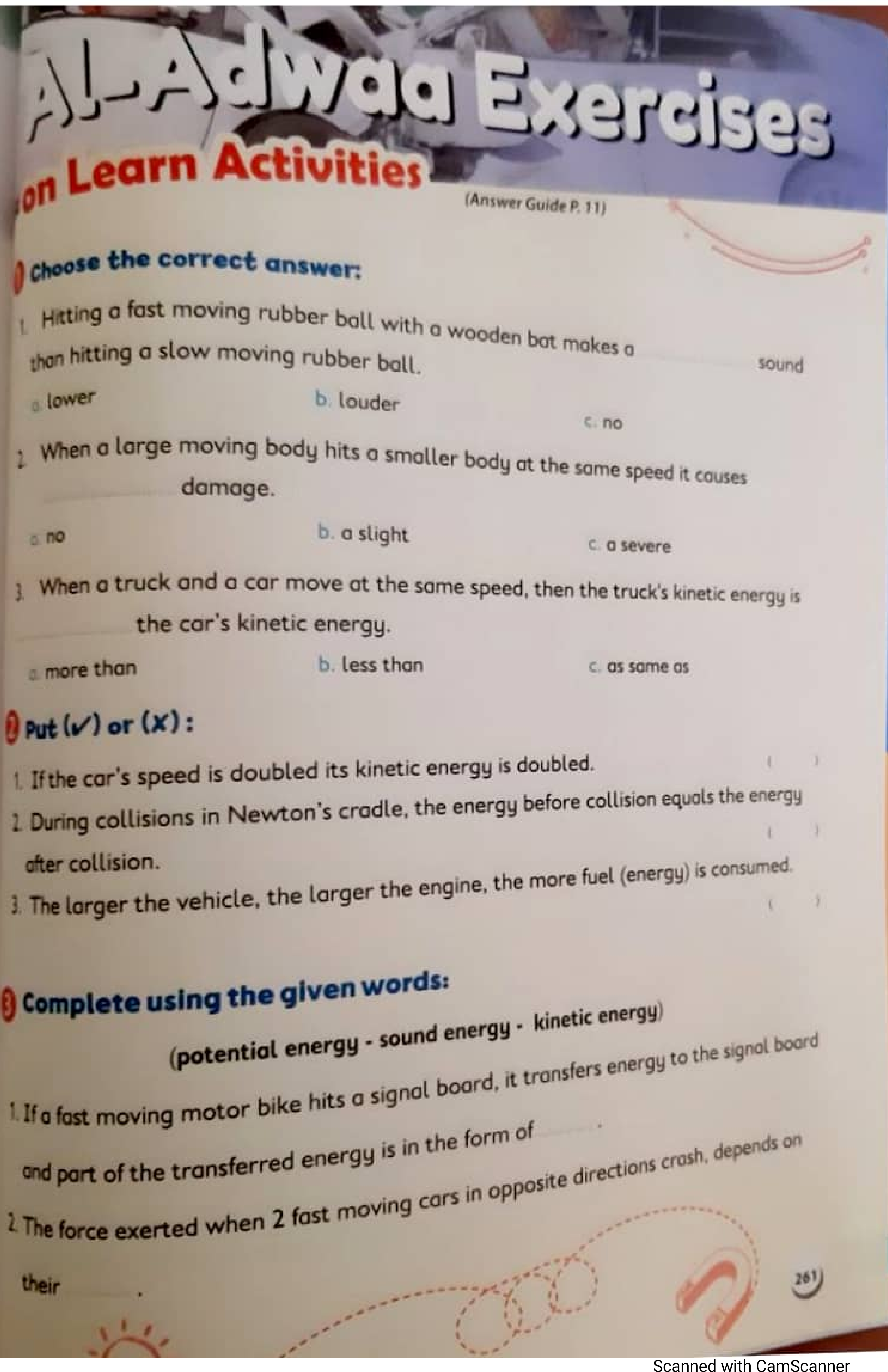
Apply Like a Scientist

(Answer Guide P. 10)

Complete the following sentences using the given words:

(after – does not disappear – sound energy – before – heat energy)

1. The energy .... , but changes from one form to another.
2. In Newton's cradle, an amount of energy is lost in the form of .... energy.
3. When a collision occurs , the energy .... collision is equal to energy .... collision.



Al-Adwaa Exercises on Learn Activities

(Answer Guide P. 11)

1 Choose the correct answer:

1. Hitting a fast moving rubber ball with a wooden bat makes a .... sound than hitting a slow moving rubber ball.
   a. lower b. louder c. no
2. When a large moving body hits a smaller body at the same speed it causes .... damage.
   a. no b. a slight c. a severe
3. When a truck and a car move at the same speed, then the truck's kinetic energy is .... the car's kinetic energy.
   a. more than b. less than c. as same as

2 Put (✓) or (✗):

1. If the car's speed is doubled its kinetic energy is doubled. ( )
2. During collisions in Newton's cradle, the energy before collision equals the energy after collision. ( )
3. The larger the vehicle, the larger the engine, the more fuel (energy) is consumed. ( )

3 Complete using the given words:

(potential energy - sound energy - kinetic energy)

1. If a fast moving motor bike hits a signal board, it transfers energy to the signal board and part of the transferred energy is in the form of ....
2. The force exerted when 2 fast moving cars in opposite directions crash, depends on their ....



SHARE

10 Record Evidence: Collision

Activity  **Record Evidence Like a Scientist**

How can you describe what happens when a bat hits a ball?

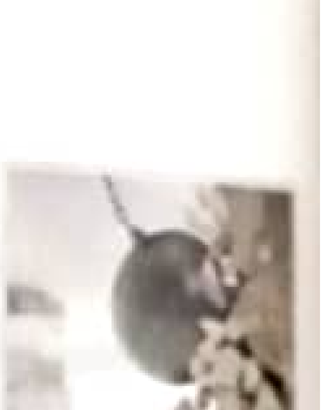
1. The kinetic energy transfers from the player's hand to the racket.
2. The ball gains this energy, and therefore it bounces in the opposite direction.
3. Some of the kinetic energy converts to sound energy when the racket collides with the ball.

- Look at the " Can you Explain?" like a scientist:

What happens to objects when they collide with other objects?

Claim:

When an object collides with another object, energy transfers.



Evidence:

1. We observed that the harder we throw a ball of clay at a platform the more damage occurs to it.
2. This shows that more speed means more kinetic energy in collisions.
3. We read that larger vehicles with more mass have more kinetic energy than smaller vehicles with less mass.
4. In a collision, more mass means more force.

Scientific Explanation:

- The speed and kinetic energy of objects increase with the increase in their mass.
- As the applied force on an object increases, the speed increases, and the kinetic energy increases causing more collision.
- Fast objects cause more damage than slow objects due to their high kinetic energy.
- When the mass and the speed of an object increase, the kinetic energy increases.
- When a collision occurs, kinetic energy changes into sound, light or heat energy.





Lesson 6 (11) STEM in Action

Collision Investigation Police

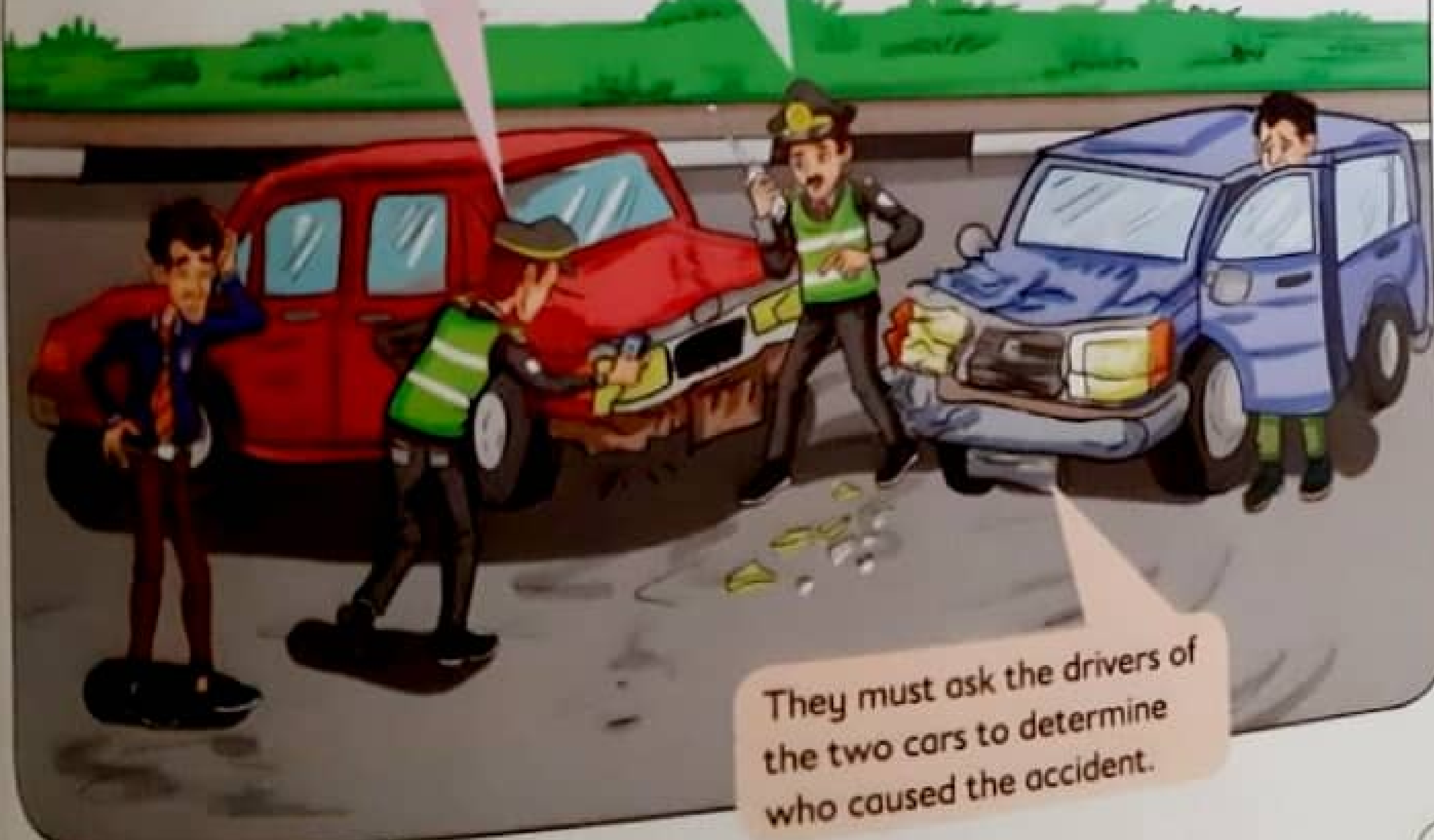



Activity: Analyze Like a Scientist

If you like to solve puzzles, if you are good at looking for important details, so you may be interested in a career as a crash investigator.



1 How does a crash investigator deal with collisions and handle crashes?





SHARE



2 Accident investigator tasks

1 Take measurements from the scene of the accident.



1. He /She measures damage to the cars and where the car ended up after the crash.
2. Use photos and videos that provide needed information of the crash scene instead of taking the measurement at the scene directly.
3. Vehicles are stored for close inspection for damage.

2 Collecting data.



1. Know the force that acted on a vehicle.
2. Measure the vehicle mass by using the scale.
3. They use reference materials, such as measurements that the car manufacturers supply.
4. They compare the cars from the crash to the data the manufacturers supply, the comparison helps them know how much force was involved in the crash.



3 Crash Site Scenario

- The following figures are done by a crash investigator showing upper diagrams of two cars before collisions of two accidents from different directions.



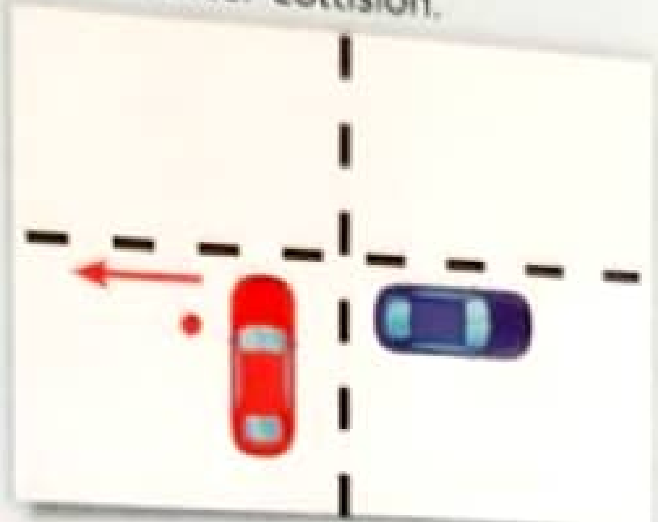
The front collision

- The red car is moving in the intersection in a correct way slowly.
- The blue car is moving fast in the wrong direction.
- The two cars meet.
- The two cars collide from the front.
- The arrow indicates the direction of the red car after collision.



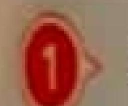
The side collision

- The red car is moving inside the intersection from the stop line.
- The blue car is moving in a straight line
- The blue car hits the red car.(knowing both has the same mass)
- The arrow indicates the red car direction after collision.





Research in the following disciplines to learn more about cars.



1. **Science**
   - Using Newton's laws of motion to know the effect of force on cars during collisions.



2. **Technology**
   - The development of the safety tools in modern cars.



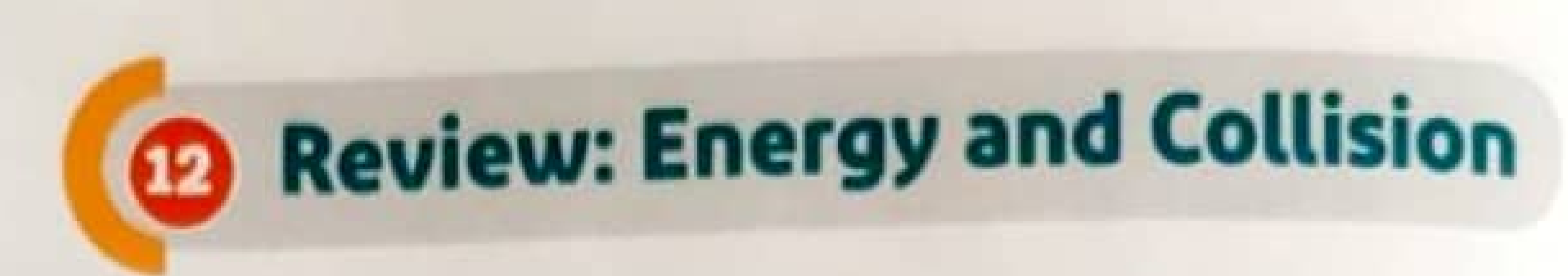
3. **Engineering**
   - Use geometric shapes to design a car model with caring for the streamline shape to enable it to overcome the air resistance.



4. **Mathematics**
   - Measures the car dimensions, and the height between tires and the road.







12 Review: Energy and Collision

Activity: Evaluate Like a Scientist

Complete the following diagrams to create a concept summary and then share it with your classmates.

1. Collision is ....

2. **Car's Safety Equipment**

Seatbelt

Function: ....
....

Airbag

Function: ....
....

3. **Factors affecting the kinetic energy of objects**

1. .... 2. ....

4. **Some energy is lost in Newton's cradle including:**

a

b

c

Parents' Tips:

Help your child to make a summary about the concept

Al-Adwaa

Exercises on Concept 4

(Answer Guide P.11)

1 Choose the correct answer:

1. The force of collision depends on the __________ the colliding bodies.
   a. mass of b. energy of c. speed of d. All the previous answers
2. The collision between moving bodies causes __________.
   a. sound energy b. kinetic energy c. heat energy d. All the previous answers
3. If a motor bike hits an adult pedestrian in the street it may cause __________.
   a. slight injuries, due to the high speed b. severe injuries, due to the low speed
   c. severe injuries, due to the high speed d. No correct answer
4. A tennis player hits the tennis ball using tennis racket, so the energy transfers from the ______.
   a. racket to the small ball only b. small ball to the racket to the player's hand.
   c. player's hand to the racket to the small ball d. No correct answer
5. What happens when a driver presses the brakes and stops suddenly? __________
   a. The passenger moves backwards b. The passenger moves forwards
   c. The passenger remains stable d. No correct answer

2 Complete the following using the given words:

(potential – Seatbelt - half - energies)

1. When we lift-up the 1st ball of Newton's cradle __________ energy is stored.
2. ______ is a safety equipment that prevents body from moving forward when collisions happen.
3. If a truck's mass is 1 ton, it has __________ energy than a 2-ton truck has.

3 True or False:

1. When a collision happens, the energy is lost in the air. (__________)
2. Sound energy only is produced during collisions. (__________)
3. The mass of the moving objects does not affect their kinetic energy. (__________)
4. When 2 fast moving bodies collide, the energy disappears. (__________)

4 Write the scientific term for each of the following:

1. It is the crash that happens between objects, causing a great energy transfer between these bodies. (__________)
2. It is a required safety equipment in the car's safety system, that inflates automatically once the crash sensors detect a collision. (__________)

5 What happens if...?

1. We released the 1st (ball) of Newton's cradle.

....

2. A huge truck hits (collides with) a car moving at the same speed.

....

6 Give a reason for:

Seatbelt is important.

....



LAB SAFETY PROTOCOLS

Dress for Safety

Safety Goggles

Wear safety goggles to protect your eyes when handling chemicals, liquids, or organisms.

Lap Coat

Wear a lab coat (or apron) over your clothes. Wear proper clothing and clothing protection. Tie back long hair, roll up long sleeves, and if they are available.

Gloves

Use gloves to protect your hands.

Long Sleeves

During field investigations, wear long pants and long sleeves.

Long Pants

Closed Shoes

Always wear close-toed shoes.

Be Prepared for Accidents!!

Safety First

Known location of safety equipment and emergency numbers.

- Even if you are practicing safe behavior during an investigation, accidents can happen.
- Once an accident occurs, immediately alert your teacher and classmates. Do not to keep the accident a secret or respond to it by yourself.



Practice Safe Behavior

There are many ways to stay safe during a scientific investigation. You should always use safe and appropriate behavior before, during, and after your investigation.

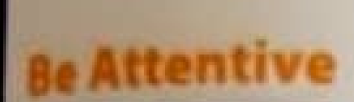
Steps of procedures

Read and understand all of the steps of the procedure. Ask your teacher for help if you do not understand any part of the procedure.



ID Hazards

Label any chemicals you are using. Always read labels before using any chemicals.
Gather all your materials and keep your workstation neat and organized.



Be Attentive

Be attentive while the lab. Don't leave an experiment in progress.



No Food

Don't eat or drink in the lab and never taste chemicals.

Respect Nature

Treat animals & plants with respect during an investigation.



Proper Supervision

Don't perform lab experiments without instructor supervision.
If asked to observe the odor of a substance, cup your hand over the container holding the substance and gently wave air toward your face to be able to smell.

Handle Glassware Carefully

Properly dispose of anything that breaks.

Make sure that you have returned any extra materials and disposal of anything that breaks to the correct storage space.



Clean Up

After completing the lab, carefully clean your workspace and the equipment. Don't forget to wash your hands.

Glossary



Unit 1

"Bank of Most Important Terms"

Term	Definition
Adaptations	A behavior or physical feature that has changed over time to help an organism survive in its environment.
Air	The part of the atmosphere that organisms on Earth use for respiration.
Arctic	Being from an icy climate, such as the north pole.
Behavior	All of the actions and reactions of an animal or a person.
Camouflage	The coloring or patterns on an animal's body that allows it to blend in with its environment.
Digestive system	The body system that breaks down food into tiny pieces so that the body's cells can use it for energy.
Ecosystems	All the living and nonliving things in an area that interact with each other.
Migration	The movement of a group of organisms from one place to another, usually due to a change in seasons.
Organism	Any individual living thing.
Pollution	When harmful materials have been put into the air, water, or soil.
Predator	An animal that hunts and eats another animal.
Prey	An animal that is hunted and eaten by another animal.
Respiratory system	The system of the body that brings oxygen into the body and releases carbon dioxide
Survive	Continue living or existing: an organi sm survives until it dies; a species survives until it becomes extinct.
system	A group of related objects that work together to perform a function
Trait	A characteristic or property of an organism.
Brain	The main control center in an animal body; part of the central nervous system
Nerve	A cell of the nervous system that carries signals to the body from the brain and from the body to the brain and/or spinal cord.
Receptor	Nerves located in different parts of the body that are especially adapted to receive information from the environment.
Feature	Things that describe what something looks like.
Light	A form of energy that moves in waves and particles and can be seen.
Matter	Material that has mass and takes up some amount of space.



Opaque	An object that light cannot travel through.
Pupil	The black circle at the center of an iris that controls how much light enters the eye.
Reflect	light bouncing off a surface.
Transparent	Materials through which light can travel; materials that can be seen through.
Code	Information transformed into another, representative, form (Such as using dots and dashes to represent letters).
Model	A drawing, object, or idea that represents a real event, object, or process.
Satellite	A natural or artificial object that revolves around another object in space.

Unit 2

Term	Definition
Energy	The ability to do work or cause change; the ability to move an object some distance.
Work	A force applied to an object over a distance.
Energy transfer	The transfer of energy from one object to another, such as heat energy.
Force	A pull or push that is applied to an object.
Friction	A force that slows down or stops motion.
Gravity	The force that pulls an object toward the center of Earth.
Motion	When something moves from one place to another.
Speed	The measurement of how fast an object is moving.
Chemical energy	Energy that can be changed into motion and heat.
Energy source	Where a form of energy begins.
Gravitational potential energy	Energy stored in an object based on its height and mass.
Kinetic energy	The energy an object has because of its motion.
Mass	The amount of matter in an object.
Potential energy	The amount of energy that is stored in an object.
Sound	Anything you can hear those travels by making vibrations in air, water, and solids.
Sound wave	A sound vibration as it is passing through a material; most sound waves spread out in every direction from them source.
Resistance	When materials do not let energy transfer through them.
Collision	The moment where two objects hit or make contact in a forceful way.



Gem

SCIENCE

FIRST TERM

4th PRIM.

Ongoing Assessment Booklet

2022



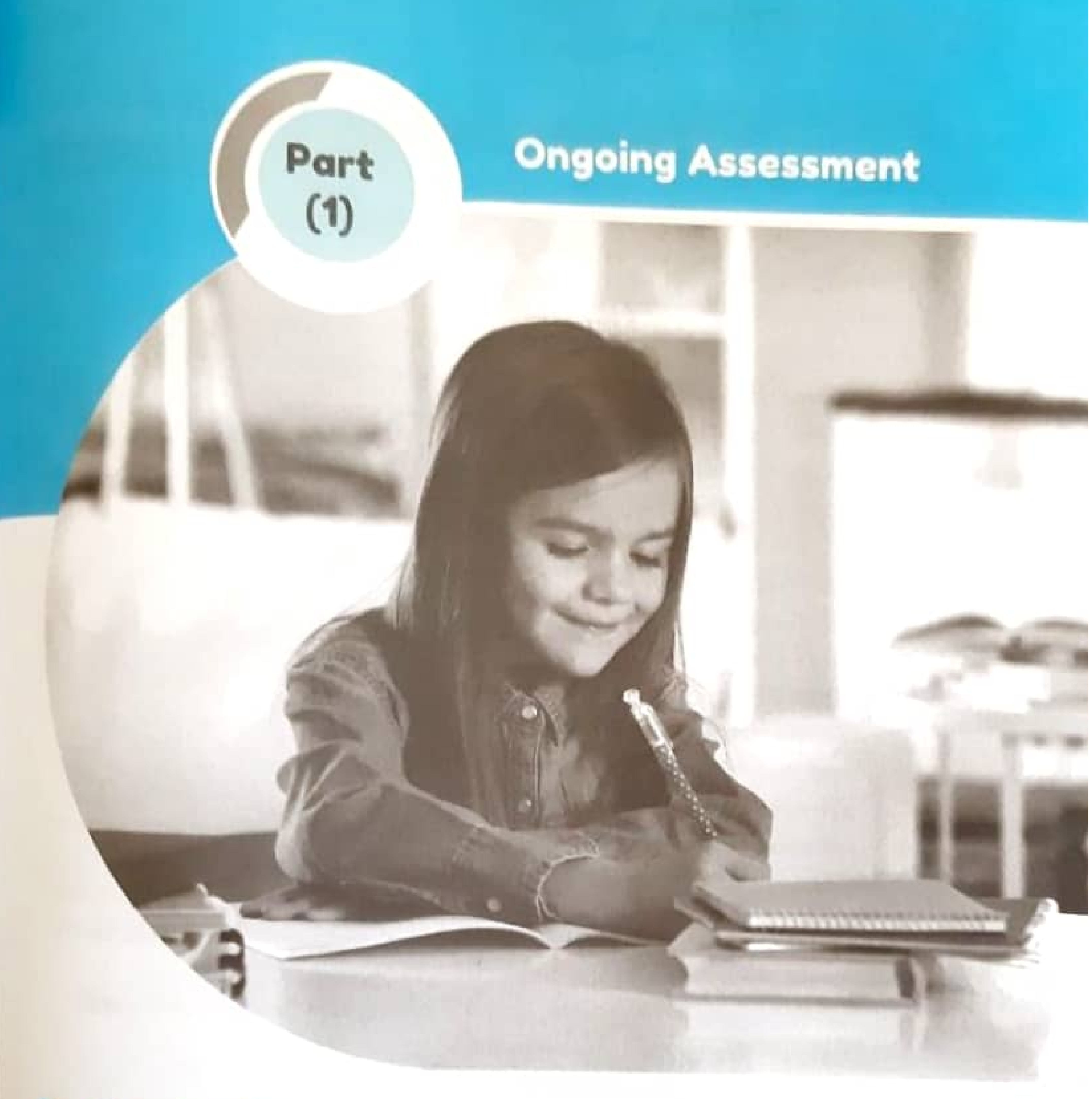
Contents







Part (1) Ongoing Assessment



Contents:

Concept 1 Adaptation and Survival

Answer Guide: P. 11

Assessment

(Total mark) 20

1 Choose the correct answer:

1. All the following are from the structural adaptation in Acacia tree except ______ .
   a. having umbrella-shaped leaves
   b. having taproot
   c. sending a smelly message in the wind to warn other trees
   d. No correct answer
2. Most predator birds like hawks possess tools such as ______ to tear the meat of their prey which is a ______ adaptation.
   a. sharp teeth, structural
   b. sharp beaks, behavioral
   c. sharp beaks, structural
   d. broad beaks, behavioral
3. The antelope that lives in the vast plains adapts through ______ .
   a. a thick fur that helps it to keep warm in winter
   b. long legs that help it run fast
   c. bright colors that help it attract the other sex
   d. a strong outer shell that protects it
4. Which would die if it did not have the right adaptations for survival in its environment?
   a. a rock
   b. a car
   c. an apple tree
   d. a glass
5. The growth of a plant is influenced by its adaptations to the weather conditions. A girl observes that a desert plant fails to grow in humus-rich well-watered soil. The most likely reason for this is that ______ .
   a. humus prevents plant growth
   b. a desert plant survives in less water
   c. water easily drains out in a humus soil
   d. a desert plant needs more nutrients in the soil for growth

2 Complete the following sentences:

1. ______ is the change in the organism's behavior to adapt with its habitat and survive like hibernation bears during winter.
2. Desert plants are distinguished by their ______ leaves, while ______ and ______ roots.

3. ____________ are surround by blood vessels in order to allow gaseous exchanges.
4. Your body needs to ____________ so your heart can beat and your lungs can breathe.
5. Aquatic organisms like fish breathe oxygen through ____________.
6. The diaphragm moves ____________ and ____________ during inhalation process.
7. The cuttlefish ejects a black fluid when it feels danger to be able to escape, this is a kind of ____________ adaptation.

3 Match from column (B) what suits in column (A):

(A)	(B)
1. Acacia branches contain thorns.	a. Behavioral adaptation.
2. The squirrel collects its food and stores it for the winter.	b. as it blends in the bright light.
3. Bears that live in forests	c. Diaphragm.
4. Fish and marine animals swimming under the bull shark can't see it	d. have dark fur to hide.
5. The muscle that plays an important role in respiration.	e. Structural adaptation.

4 (A) Give a reason for each of the following:

1. Arctic fox fur changes its color during seasons.

____

2. The inhaled air differs from the exhaled air during respiration process.

____

3. Man can affect the environment negatively and that harms him and other living organisms.

____

(B) Write the scientific term:

1. It is a type of adaptation that helps animals hide from predators or attack their prey. (____________)
2. Breaking down the food into its simplest form providing our bodies with nutrients. (____________)

Concept 2 Senses at Work

Answer Guide: P. 11

Assessment

(Total mark) 20

1 (A) Choose the correct answer:

1. On a hot summer day, Omar climbed his tree house using a ladder after leaving the swimming pool, and his toe was bumped on a ladder and hurt during climbing the tree. How did Omar know he had hurt his toe?
   a. The nerves in his hurt toe sent a signal through his body to his brain.
   b. The blood cells in his toe sent a signal through his body to his brain.
   c. Omar's toe became very cold and numb.
   d. Omar's toe became smaller than before he had bumped it on the ladder.

2. Rami suddenly stopped his bike because he heard the sound of a car speeding towards him. Which system received the external signal of hearing that enabled Rami to respond by stopping his bike?
   a. Circulatory system
   b. Excretory system
   c. Muscular system
   d. Nervous system

3. Read the following scenarios. In which part of the event is your nervous system receiving a message?
   a. When you touch cactus thorns.
   b. When you pull your hand away.
   c. When you yell "Ouch".
   d. When your finger begins to bleed.

(B) Correct the underlined words:

1. Bats use echolocation as they have super sight sense. (..............................)
2. The auditory stimulation is faster than the visual stimulation. (..............................)

2 Complete the following sentences:

1. .... is responsible for feeling pain.
2. The group of nerves that are connected to the brain and pass through the backbone is called ....
3. A blind person can determine the location of his friend through the sense of ....
4. Pulling the hand directly when touching a hot object is called ....

3 **(A) Students in a classroom hear a tornado siren go off. Which of the following could be ways in which they respond? Read the selections and tick (✓) next to the correct responses:**

1. The ear senses a loud sound causing the brain to send a message to the hands to cover the ears. ( )
2. The nose smells bad odor causing the brain to send a message to the hands to pinch their noses shut. ( )
3. The siren sends a message to students' brain reminding them of a scary tornado event last year. It also sends signals to the brain to send a message for the students to yell in alarm. ( )
4. The ears pick up noise and the brain tells the legs to jump off the seat. ( )
5. The ears sense sound and the brain sends messages to the hands to rub their elbows in pain. ( )

(B) What happens when...?

1. Egyptian Mongoose produces chatters.

   ....

2. Your hands touch a very hot object.

   ....

4 **(A) Give reason for each of the following:**

1. Bats, whales and dolphins have super senses to hunt.

   ....

2. The owl's bowl-like head helps it to hear what it can't see.

   ....

3. When someone hits your body strongly, you feel pain and move your body away from danger.

   ....

(B) Write the scientific term:

1. The organs that receive the external stimuli from the environment. (..............................)
2. Animals that are active and hunt at night. (..............................)

Concept 3 Light and Sight

Answer Guide: P. 12

Assessment

(Total mark) 20

1 Choose the correct answer:

1. The nocturnal animals are active in ________ to find food.
   a. day b. night c. day and night d. summer
2. The light waves are ________ when they fall on a rough surface.
   a. diffused b. reflected c. refracted d. absorbed
3. The light passes easily through the ________ objects.
   a. transparent b. opaque c. reflected d. (b) and (c)
4. ________ is similar to the owl in observing the objects everywhere at the same time.
   a. Tarsier b. Fishing cat c. Camel d. Human
5. ________ is a source of light.
   a. Moon b. Metallic spoon c. Sun d. Eye

2 Complete the following sentences:

1. Some animals that have a special structure in their eyes, such as reindeer, cats and dogs are known as ________.
2. ________ objects reflect most of light rays like mirror and aluminum foil.
3. We see our image in the mirror as a result of light ________.
4. ________ materials don't allow light to pass through.
5. ________ surface reflects light irregularly.

3 (A) Write the scientific term:

1. Its eyes are sensitive to the light and shine in the dark. (________)
2. It is the visible form of energy that travels in waves. (________)
3. It is the bouncing (returning back) of light rays when they fall on a reflecting surface. (________)

(B) Give reason:

1. Moon is not a source of light.

2. Fishing cats' eyes shine in the dark.

4 (A) What happens when ...?

1. The light falls on a clear glass.

2. Looking at an object inside a dark box.

(B) Answer the following questions:

1. • Talia visited a lake surrounded by mountains. She observed the image of the mountains on the surface of the lake's water.

   • Talia built a diorama to model what she saw. She used a postcard of a mountain scene to represent the mountains and a small mirror to represent the lake.



   • Which is the best explanation of why her model represents what she saw?

   a. The mirror refracts light into the image of the mountain on the postcard.
   b. The mirror reflects light into the image of the mountain on the postcard.
   c. The image of the mountain on the postcard is refracted by the mirror.
   d. The image of the mountain on the postcard is reflected by the mirror.

2. Which statement best explains why you can see yourself when you look at a mirror?

   a. Light is refracted as it passes through the mirror.
   b. Light is reflected, bouncing off the mirror.
   c. Light is refracted, bouncing off the mirror.
   d. Light is reflected as it passes through the mirror.

Concept 4 Communication and Information Transfer

Assessment

(Total mark) 20

1 **(A) Choose the correct answer:**

1. The rough and sharp sounds can be expressed by ....
   a. sound pitch b. sound shape
   c. sound waves d. temperature

2. All of the following are examples of codes except ....
   a. face expressions b. hand waves
   c. traffic light colors d. watching TV

3. The ability of fireflies to emit flashes of light is a kind of ....
   a. camouflage b. behavioral adaptation
   c. structural adaptation d. imitation

(B) Answer the following question:

- Which of the following parts can form a communication system? You can circle more than one part.


The sun

The television


Satellite


Dish receiver

2 **Complete the following:**

1. Humpback whales sing in the winter for .... season, while they sing in the summer for the .... season.
2. Ant groups communicate through a .... sense and this is considered a .... type of adaptation.
3. The eye uses .... energy, while the ear uses .... energy to collect information and sends it to the brain.

4. The ancient Egyptians created ________ paper for writing, which was made from reed plant.

5. An example of communication systems is ________.

3 **(A) Look at the following figure, then answer:**

- The opposite image shows the hieroglyphic writing, can your brain translate these writings? And why?

....

....

(B) Mention the importance of technological communication systems between human beings.

....

....

....

4 **Correct the underlined words:**

1. Light is a code that uses symbols and letters to transfer information. (..................)
2. Light is a pattern that has meaning. (..................)
3. Humans are similar to bees in the way they communicate through speaking. (..................)
4. Writing is a code used daily in the form of sounds. (..................)
5. A cell phone is a part of engineering system. (..................)


Assess&Reflect
Concept 1 - Assessment
20
Concept 2 - Assessment
20
Concept 3 - Assessment
20
Concept 4 - Assessment
20
From 19-20
Great job! You can also enrich your information by searching the topics you prefer.
from 17-18
Very Good
Answer more Exams through Al-Adwaa Application.
from 14-16
Good
Practice more. Using the Question Bank section in Al-Adwaa Application.
from 10-13
Use the Explanation Videos & Summaries in Al-Adwaa Application.
Less than 10
Weak
Improve your understanding by re-reading the given information in the Main Book.

Concept 1 Starting and Stopping

Answer Guide: P. 12

Assessment

(Total mark) 20

1 (A) Complete the following sentences:

1. When .... forces applied on an object, it does not move.
2. The force of gravity is considered a .... force and its direction is always towards the center of the earth.
3. The friction force acts in the .... direction of the motion.
4. When a force is applied on an object, it moves at the .... direction of the applied force.

(B) Write the scientific term:

1. The change in the position of an object. (....................)
2. The action of the pull or the push applied on an object causing its motion. (....................)
3. The ability to do work. (....................)
4. The measure of energy transfer that occurs when an object is moved over a distance. (....................)

2 (A) Choose the correct answer:

1. Talia notices that the position of her golf ball on the green has changed in comparison to the flagpole in the hole. This change is a result of ....
   a. motion of the flagpole
   b. motion of the ball
   c. speed of the ball
   d. speed of the flagpole
2. A toy car is sitting still in the driveway. Ali kicks the car and it spins moving sideways. The car is considered in motion because ....
   a. the car was kicked
   b. the car did a wheelie
   c. the car has four wheels
   d. the position of the car changed
3. Ahmed is pushing a big box. Ali comes to help him. How does this change the force and motion of the box? ....
   a. It does not change the force or the motion.
   b. It increases the force and decreases the motion.
   c. It increases the force and increases the motion.
   d. It decreases the force and increases the motion.

Assessments on Concepts

(B) Look at the following, then answer:



1. The class is playing tug-of-war in the courtyard. There are 3 students on either side of the rope. What would explain that no one has moved?
   a. One team has more force than the other.
   b. One team has half the force of the other.
   c. The teams have equal and opposite forces.
   d. The teams have unequal and opposite forces.
2. The class is playing tug-of-war in the courtyard. There are 3 students on either side of the rope. What would explain that no one has moved?
   a. One team has more force than the other.
   b. One team has half the force of the other.
   c. The teams have equal and opposite forces.
   d. The teams have unequal and opposite forces.

3 **(A) Tick (✓) the correct answer:**

Imagine you are riding in a car down the highway. What are the objects that you can look at to let you know the car is in motion?

- ☐ The soccer ball sitting in the seat next to you.
- ☐ The sign of the highway telling you the speed limit.
- ☐ The can of soda in the cup holder.
- ☐ The light pole you see out the window.
- ☐ The parked car that you pass on the road.

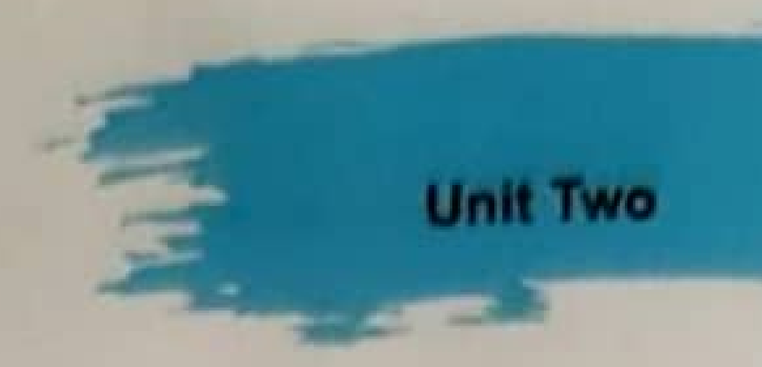
(B) Things that must occur to move a body:

1. ______________ . 2. ______________

4 **Complete using the given words:**

(remain at rest - air force - equal - pull - friction)

1. When two equal forces act in opposite directions on a stationary body, it will ______________
2. ______________ causes the movement of sailboats in the water.
3. Objects stop motion when the forces acting on it are ______________ .
4. ______________ force slows down moving objects.
5. Falling of the pen towards the ground is an example of ______________ force.



Concept 2 Energy and Motion

Answer Guide: P. 12

Assessment

(Total mark) 20

1 (A) Complete the following:

1. .... changes from one form to another, but it never gets destroyed.
2. During going upwards from the ground, the .... energy increases gradually.
3. While operating an electric fan, the .... energy changes into .... energy.

(B) Correct the underlined words:

1. Bodies in motion do not have any kinetic energy. (............)
2. Radiant "Light" energy is a form of potential energy. (............)

2 (A) State whether each of the following statements is "True" or "False":

1. Potential energy is the stored energy in an object due to its position. (............)
2. As the moving object goes upwards, the potential energy increases. (............)
3. A bicycle on the top of the hill stores elastic potential energy. (............)
4. A ball rolling on a flat sidewalk has kinetic energy but not potential energy. (............)
5. The battery in a clock produces kinetic energy only to operate. (............)

(B) Write the scientific term for each of the following:

1. The energy stored in an object. (............)
2. The ability to do work. (............)

3 Choose the correct answer for each of the following:

1. During clapping your hands together, the energy of our hands is converted into .... and .... energy.
   a. sound, thermal
   b. electric, sound
   c. thermal, kinetic
   d. No correct answer
2. While operating the electric oven to cook food, it uses .... energy.
   a. electric
   b. sound
   c. chemical
   d. heat

Assessments on Concepts

3. When an object has ________ energy, this means that this object is ready to do work.
   a. sound b. light c. kinetic d. potential
4. When the cell phone uses a battery to operate, it uses ________ energy.
   a. electric b. light c. sound d. thermal
5. On heating matter, its particles vibrate. This represents ________ energy.
   a. carbon dioxide b. potential
   c. vapor d. kinetic

4 **(A) Mention the energy conversions in each of the following:**

1. The car's engine. ________
2. Electric oven. ________
3. Batteries. ________
4. A fruit falls down from a tree. ________

(B) Look at the opposite figures, then answer:

1. Before the archer leaves the bow's string, the string stores ________ energy.
2. When the archer leaves the bow's string, the energy changes from ________ energy into ________ energy.

(C) 1. Which one will fall first, the feather or the ball? ________.

2. Which one stores more gravitational potential energy as they are lifted to the same height? ________ Why? ________.



Concept 3

SPEED

Answer Guide: P. 12

Assessment

(Total mark) 20

1 (A) Complete the following:

1. The object that moves ________ has high speed, while the object that moves ________ has low speed.
2. The car's speed that travelled a distance of 180 kilometers, in 2 hours is ________ .
3. The powerful engines of high-speed trains allow them to move with ________ speed and it consumes larger amount of ________ .

(B) Correct the underlined words:

1. As the driver lifts his/her feet away from the gas pedal, the speed will increase. (................)
2. As the toy truck is lighter than the toy car, so the speed of the toy car rolling down an inclined surface is less than the speed of the toy truck. (................)
3. A man pulls the leash of a dog to increase its speed when the dog tries to run.

2 (A) State whether each of the following statements is "True" or "False":

1. "Kilometer/Hour" is the only measuring unit of speed. (................)
2. The high speed of a moving body means that the moving body can travel the longest distance in the least period of time. (................)
3. When the speed of a moving body decreases, its kinetic energy decreases. (................)

(B) Write the scientific term for each of the following:

1. It is the rate of change of distance per unit time. (................)
2. The length of the path traveled by a moving body. (................)

3 (A) Choose the correct answer:

1. In a car race, 2 cars arrived at the finish-line at the same time, this means that ________ .
   a. both cars moved different distances in a different period of time.
   b. both cars moved different distances in the same period of time.
   c. both cars moved the same distances in the same period of time.
   d. both cars moved the same distances in a different period of time.

2. When a huge truck moves downhill, its ________ increases due to its ________
   a. potential energy – heavy mass b. potential energy – light mass
   c. kinetic energy – heavy mass d. kinetic energy – light mass
3. To calculate the speed of a moving object, we need to know the ________
   a. temperature and distance travelled by the moving object
   b. distance travelled by the moving object only
   c. temperature, time taken and distance travelled by the moving object
   d. time taken and distance travelled by the moving object
4. To slow down the speed of a moving object, we have to ________.
   a. reduce the applied force acting on it b. increase the applied force acting on it
   c. increase its radiant energy d. all of the previous
5. ________ are from the structural adaptations in a horse that allow it achieves its high speed.
   a. Strong muscles b. Large heart
   c. Strong hooves to run on hard and uneven ground.
   d. All the previous answers

(B) Look at the opposite figures, then answer:





Two cyclists have the same mass.

- Cyclist (A) is moving with a speed of 20Km/h
- Cyclist (B) is moving with 40 Km/h.

Which cyclist has more kinetic energy and why?

____

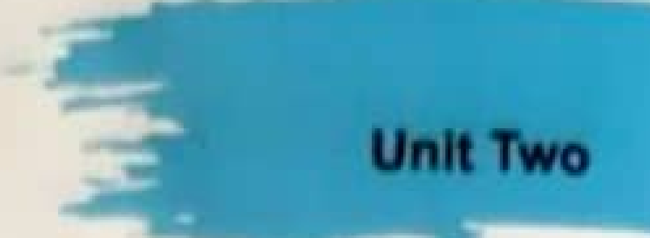
____

4 **The speed of a moving object is affected by many factors such as its mass, the surface it moves along, the friction force and the angle of inclination.**

From the previous sentence, do two similar vehicles move from the same starting point, one on a high way road and the other in the desert consume the same amount of energy to reach the same destination at the same time? And why?

____

____





Concept 4 Energy and Collision

Answer Guide: P. 13

Assessment

(Total mark) 20

1 **(A) Complete the following:**

1. ________ is safety equipment in the car which inflates automatically when collision occurs.
2. When collision between 2 moving bodies happens, ________ energy is produced between them.
3. During collision, ________ and ________ energies are produced.

(B) Correct the underlined words:

1. During collision, the small mass objects cause severe damage to the collided objects. (________)
2. Speed doesn't end, but it can only change from one form to another. (________)

2 **(A) "True" or "False":**

1. When a fast-moving car hits a traffic sign, all its energy will transfer to the traffic sign. (   )
2. As the mass of an object increases, its kinetic energy increases. (   )

(B) Choose the correct answer:

1. When two cars move in opposite directions collide, the ________ .
   a. energy of the fast car is more and causes more damage.
   b. energy of the fast car is small and causes less damage.
   c. energy of the slow car is more and causes more damage.
   d. energy of the small car is small and causes less damage.
2. The kinetic energy of a vehicle increases when ________ .
   a. its speed decreases
   b. its mass decreases
   c. its mass and speed increase
   d. no correct answer

3 Choose from column (B) what suits in column (A):

(A)	(B)
1. When two cars move in the same direction collide.	a. Fast driving.
2. When two cars move in the opposite direction collide.	b. Car tires.
3. From the safety equipment in the car.	c. Seatbelts.
4. From the dangers of driving cars.	d. Less damage occurs.
	e. More damage occurs.
	f. No damage occurs.

1. .... 2. .... 3. .... 4. ....

4 (A) If 2 cars traveled 240 kilometers to reach their destination, the yellow car took 2.5 hours to arrive, and the green car took 3 hours to arrive:

1. Calculate the speed of the yellow car.

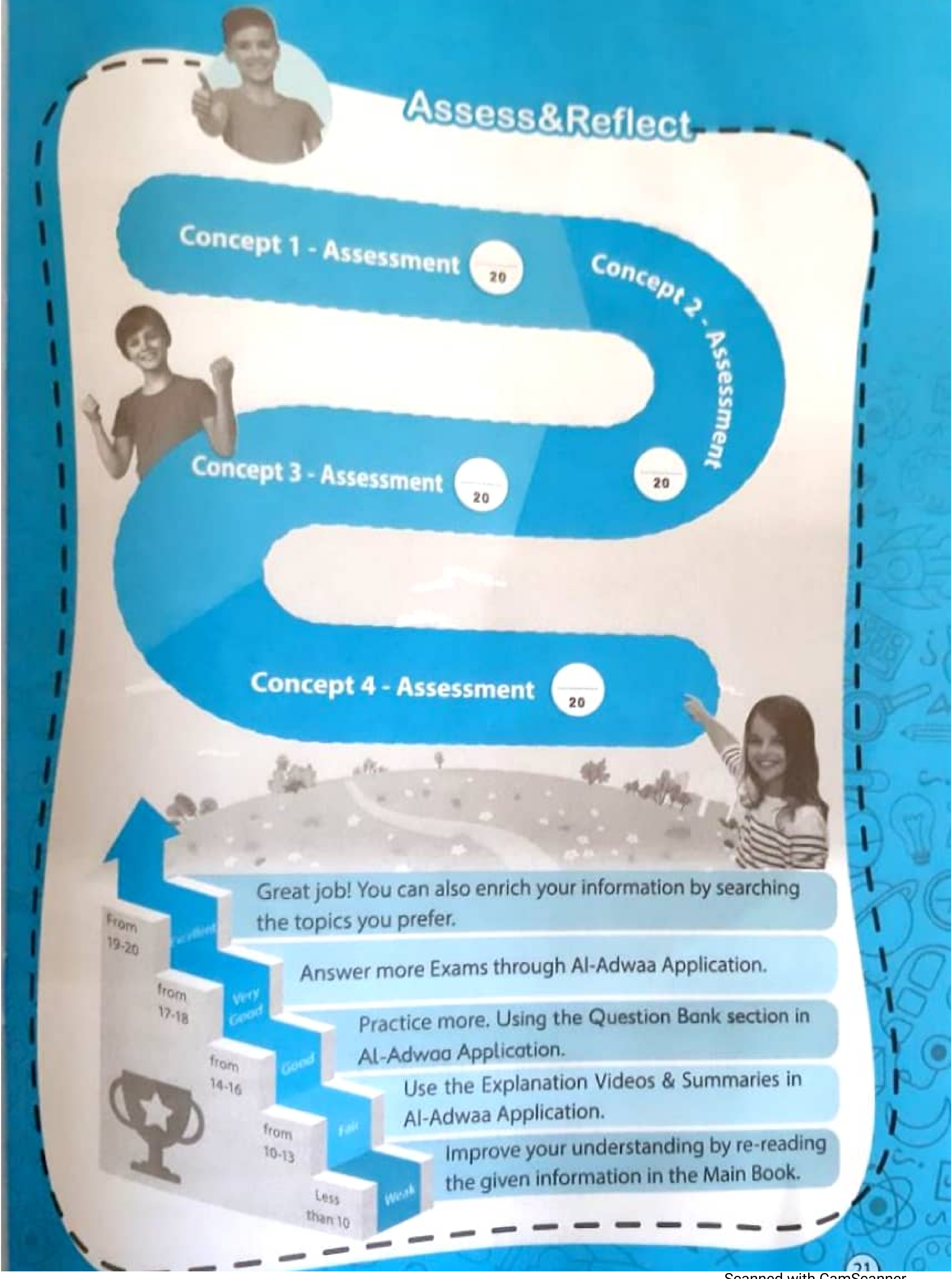
....

2. Calculate the speed of the green car.

....

(B) Tick (✓) to compare between the green and yellow cars, regarding the listed points of comparison (P.O.C):

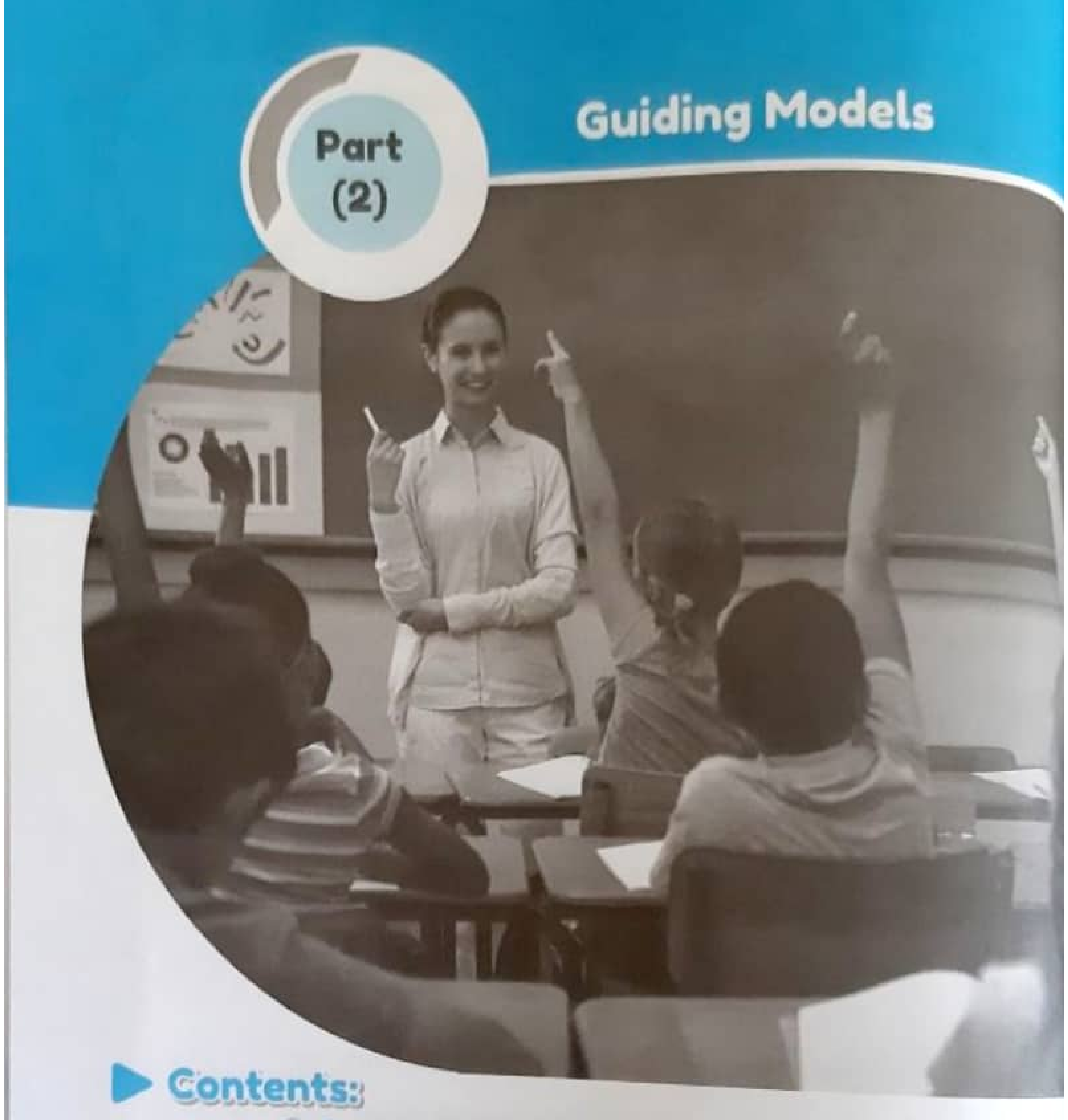
P.O.C	Green car		Yellow car	
Speed	☐ Higher	☐ Lower	☐ Higher	☐ Lower
Kinetic Energy	☐ More	☐ Lower	☐ More	☐ Lower
Car's Engine	☐ More powerful	☐ Less powerful	☐ More powerful	☐ Less powerful
Fuel consumption	☐ More	☐ Less	☐ More	☐ Less



Assess&Reflect
Concept 1 - Assessment
20
Concept 2 - Assessment
20
Concept 3 - Assessment
20
Concept 4 - Assessment
20
From 19-20
Excellent
Great job! You can also enrich your information by searching the topics you prefer.
from 17-18
Very Good
Answer more Exams through Al-Adwaa Application.
from 14-16
Good
Practice more. Using the Question Bank section in Al-Adwaa Application.
from 10-13
Fair
Use the Explanation Videos & Summaries in Al-Adwaa Application.
Less than 10
Weak
Improve your understanding by re-reading the given information in the Main Book.

Part (2)

Guiding Models



Contents:

October Guiding Models

Model 1

Answer Guide: P. 13

(Total mark) 15

1 **(A) Choose the correct answer:**

1. Animals that live in hot desert habitat .... to adapt to the environment.
   a. hide in burrows
   b. search for shade areas
   c. cool their bodies by panting
   d. all the previous answers
2. Which of the following animals is the best to adapt to very cold climate? ....
   a. An animal with long and large ears
   b. An animal that can change the color of its skin
   c. An animal with thick fur
   d. An animal with large feet that help it to swim
3. Which of the following helps a jerboa to catch sand while jumping? ....
   a. The long legs
   b. The presence of hair on its toes
   c. The big ears
   d. The long tail
4. .... processes, interprets and understands information.
   a. Brain   b. Spinal cord   c. Nerves   d. Body parts

(B) Mention the type of adaptation of each of the following:

1. The V letter shaped of the Panther Chameleon's feet. (....................)
2. The colored scales in the Panther Chameleon. (....................)
3. The lizard searches for shade areas in the desert. (....................)
4. The stick insect looks like the tree branches. (....................)

2 **(A) Write the scientific term for each of the following:**

1. The main control center in the body. (....................)
2. It is the change in the organism's behavior to adapt with its habitat to survive. (....................)
3. It begins to moist and breaks down food in the mouth. (....................)
4. An animal uses the echolocation to locate objects under the water surface. (....................)

(B) What happens when ... ?

1. An animal ate acacia leaves.

2. When you touch a plant with sharp thorns.

3 (A) Put (✓) in front of the right statement and (✗) in front of the wrong one:

1. Desert plants are characterized by their large sized leaves. ( )
2. The nocturnal animals have super sense help them to hunt at night. ( )
3. The digestive system is completely similar in all animals, even if the type of food is different. ( )
4. The parts of the nervous system work together to identify the environment and interpret information. ( )

(B) Complete the following sentences using the given words:

(Faster than – slower than – Brain – echolocation – changing colors)

1. The reaction time of auditory stimulation is ________ the reaction time of visual stimulation
2. ________ is the central control system in the body.
3. Animals can locate the prey place by ________ .
4. Animals that eat meat like foxes have ________ teeth.

4 (A) Correct the underlined words:

1. Air enters the two lungs during exhalation process. (________)
2. The bowl-like head of an owl is an example of a behavioral adaptation. (________)
3. Fish breathe by skin. (________)

(B) Look at the following figures, then answer:

1. What is the name of the opposite system? ________
2. Write the labels on the opposite figure.

a. ________

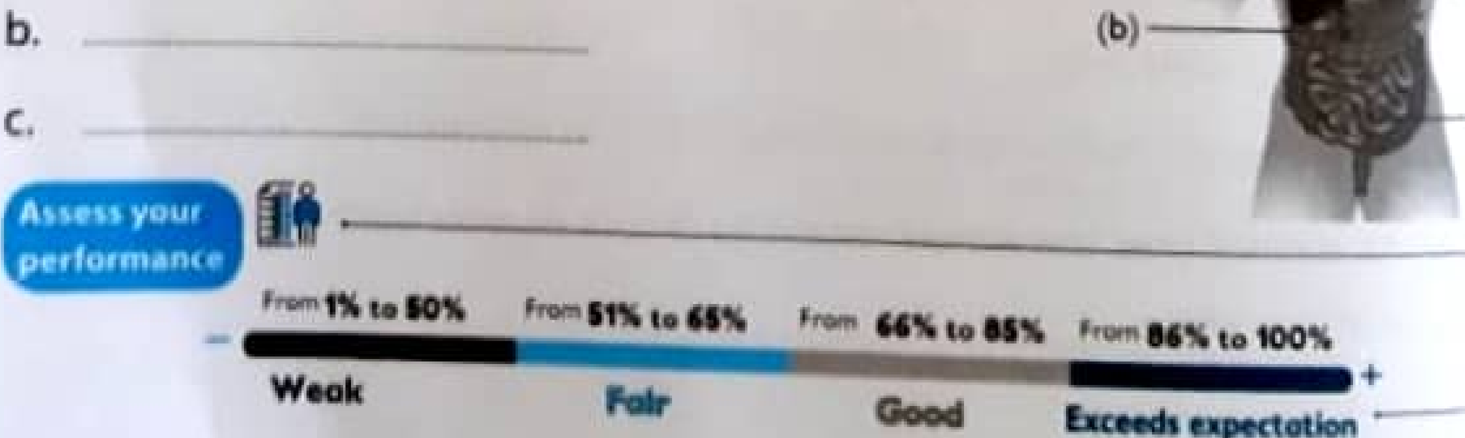
b. ________

c. ________

(a)

(b)

(c)



Model 2

Answer Guide: P. 13

(Total mark) 15

1 (A) Choose the correct answer:

1. The respiratory system of human is similar to the respiratory system of fish in ________ .
   a. both breathe through the lungs
   b. both breathe through the gills
   c. both inhale oxygen and exhale carbon dioxide gas
   d. both get oxygen through the skin
2. The ________ system is responsible for breaking down food to let the body get benefit from it.
   a. digestive
   b. nervous
   c. respiratory
   d. tongue
3. Plants that live in tropical environment and shade areas are characterized by ________ .
   a. their small leaves
   b. their short branches
   c. their sharp spines leaves
   d. their large and broad leaves
4. Which of the following characterize fish that live in dark caves at the bottom of the ocean?
   a. They are brightly colored.
   b. They have strong sense of sight.
   c. They have poor eyesight.
   d. They have no gills.
5. ________ collect information about what is happening inside and outside the body.
   a. Nerves
   b. Spinal
   c. Nervous system
   d. Body parts
6. ________ helps snakes hunt at night.
   a. Echolocation
   b. Sense heat
   c. Change of colors
   d. Sharp vision

(B) Arrange the following sentences to show how the brain processes information:

1. Nerves distributed through the body connect the sensory organs to the brain. ( )
2. The sensory organ receives information from the environment. ( )
3. The brain determines the suitable response. ( )
4. The signals are transmitted as electrical impulses from the sense organ to the nerves until it reaches the brain. ( )

2 (A) Mention the type of adaptation for each of the following:

1. Migration of birds from one place to another when the weather is cold. (________)
2. Desert plants leaves are small and have sharp spines. (________)
3. The activity of some animals at night, such as snakes. (________)

(B) Complete the following sentences using the given words:

(long ears - dark - white - supporting roots - sharp thorns - large leaves)

1. ________ helps the animals that live in the desert to lose heat.
2. The presence of ________ protects desert plants from being eaten by animals.
3. The ________ color of the fur helps the animals hide among the trees while hunting.

3 **(A) Write the scientific term for each of the following:**

1. The time taken by the body to receive information from the environment and then respond to it. (________)
2. It is the change in the characteristics of living organisms over time that helps them survive. (________)
3. A type of adaptation that helps animals hide from predators or attack their prey. (________)

(B) Choose from column (B) what is suitable for column (A):

(A)	(B)
1. The large intestine	a) help fish to obtain the dissolved oxygen in the water.
2. Gills	b) absorbs the excess liquids from the undigested food.
3. Mongoose	c) get a large amount of sunlight.
4. Broad leaves	d) makes sound seems as a chatter.

1. ________ 2. ________ 3. ________ 4. ________

4 **(A) Put (✓) in front of the right statement and (✗) in front of the wrong one:**

1. The time of auditory stimulus is faster than the visual stimulus. ( )
2. Dolphins have super senses that help them get food. ( )
3. The sense organs responsible for receiving the sound of noise is the mouth. ( )
4. The sense organ responsible for receiving the smell of perfume is the nose. ( )
5. Animals that live in hot areas are characterized by thick fur. ( )

(B) Look at the following figures, then answer:

The following organ belongs to ________ system.

Write the importance of the opposite organ.

____

____

Assess your performance ________

From 1% to 50% — Weak
From 51% to 65% — Fair
From 66% to 85% — Good
From 86% to 100% — Exceeds expectation

November Guiding Models

Model 1

Answer Guide: P. 14

(Total mark) 15

1 **(A) Choose the correct answer:**

1. When you touch a cup of hot tea, the organ responsible for your pain is ______.
   a. the brain b. the spinal cord c. the nerves d. the heart
2. Which of the following cases are affected by balanced forces? ______
   a. When the object in a rest state
   b. When a ball falls down
   c. When a car goes up a slope
   d. All the previous answers
3. The nervous system in mammals consists of ______.
   a. the brain
   b. the spinal cord
   c. nerves
   d. all the previous answers
4. What type of surface scatters light unevenly? ______.
   a. shiny b. rough c. smooth d. transparent
5. Which of the following surfaces reflects light better? ______.
   a. Wood b. Mirror c. Paper d. Cloth

(B) What is meant by ...?

- Communication system: ______

2 **(A) Write the scientific term:**

1. A pattern that has meaning. (______)
2. A force that opposes the motion of an object. (______)

(B) Choose from column (A) what is suitable for column (B):

(A)	(B)
1. They created a hieroglyphic writing	a) Work
2. Its eyes shine at dark	b) Egyptians
3. The amount of energy needed to move an object	c) Cat

1. ______ 2. ______ 3. ______

Guiding Models

3 **(A) Put (✓) in front of the right statement and (✗) in front of the wrong one:**

1. Humpback whales change their songs along the seasons. ( )
2. Energy is the ability to do work. ( )
3. Sun is the main source of light. ( )

(B) Review each statement below and decide if the motion of the objects below will be stopped by either the force of friction or by a collision with another object.

– Write the appropriate abbreviation in the space to the left of each statement.

F = Force of Friction C = Collision.

_______ A soccer ball rolls across a field.
_______ A car rolls into a wall.
_______ A pitcher throws a baseball to the catcher.
_______ A rugby player is tackled during a game.
_______ A girl on a swing eventually stops swinging.

4 **(A) Complete the following sentences using the given words:**

(opaque – less – transparent – longer)

1. _______ objects allow light rays to pass through.
2. _______ objects don't allow light rays to pass through.
3. As the force increases, the object moves _______ distance.

(B) Look at the following figures, then answer:



1. The opposite figure uses _______ to guide the ships.



2. The opposite figure shows a living organism called _______ that glows at night due to a _______ occurs inside its body.

Assess your performance _______

From 1% to 50%	From 51% to 65%	From 66% to 85%	From 86% to 100%
Weak	Fair	Good	Exceeds expectation

Model 2

Answer Guide: P. 14

(Total mark) 15

1 (A) Choose the correct answer:

1. When the force applied on a moving objects increases, ...
   - a. its speed decreases
   - b. the covered distance by this object decreases
   - c. the covered distance by this object increases
   - d. the gravity increases

2. Which of the following surfaces reflects light rays in one direction? ....
   - a. Wood
   - b. Mirror
   - c. Paper
   - d. Cloth

3. When light falls on a rough surface, it is ....
   - a. reflected
   - b. diffused
   - c. absorbed
   - d. refracted

4. The bees use .... by doing some movements to tell other bees the direction and distance to the food resources.
   - a. light
   - b. codes
   - c. speaking
   - d. movements

(B) Give reason:

1. Some animals have the tapetum lucidum in their eyes.

....

2. Moon is not a source of light.

....

2 Write the scientific term for each of the following:

1. It is a type of writing created by Babylonians in the year 3000 BC. (............)
2. Bouncing of light when it falls on a reflecting surface. (............)
3. It is the change in position of an object relative to its starting point. (............)

Guiding Models

3 **(A) Put (✓) in front of the right statement and (X) in front of the wrong one:**

1. Objects move by the effect of air force only. ( )
2. Humpback whales produce different pitched-sound in winter than in summer. ( )
3. Wood is an opaque material. ( )

(B) Complete the following sentences using the given words:

(transparent – rough – structural – code)

1. The tapetum lucidium is a .... adaptation.
2. The .... medium passes the light rays when they fall on it.
3. .... is considered a pattern that has meaning.

4 **(A) Mention an example for each of the following:**

1. A source of light. (..................)
2. An opaque object. (..................)
3. A transparent object. (..................)

(B) Circle the two true sentences about force:

- A force always causes movement.
- A force is a push or a pull.
- Two forces must be equal.
- Two forces can be unbalanced.
- Forces are only created by people.

Assess your performance

From 1% to 50%	From 51% to 65%	From 66% to 85%	From 86% to 100%
Weak	Fair	Good	Exceeds expectation



Model 3

Answer Guide: P. 14

(Total mark) 

1 Choose the correct answer:

1. Which one of the following doesn't form a shadow when light falls on it? ________ .

   a. Wood b. Tree c. Cardboard d. Clear glass

2. What word is used to describe light as it strikes a smooth, shiny surface and bounces off?

   ________ .

   a. shadow b. energy c. reflection d. wave length

3. Communication and sending information can be carried out through ________ .

   a. drums b. smokes
   c. light flashes d. all the previous answers

4. The Egyptians invented papyrus which is a type of paper made from the ________ plant.

   a. bamboo b. reed c. cactus d. mulberry

5. If equal pushing force is applied on 2 different sized trucks, so the bigger truck will travel ________ distance than the small one.

   a. longer b. shorter c. equal d. less

2 Put (✓) in front of the right statement and (✗) in front of the wrong one:

1. Some insects communicate by sending flashlight messages. ( )
2. When a balanced force is applied on a body at rest, it moves. ( )
3. Morse code consists of long and short beeps. ( )

Guiding Models

3 (A) Complete the following sentences using the given words:

(force – communication system – smooth – rough – scout)

1. __________ is the means used by humans and animals to transmit specific messages between them.
2. The light rays reflect in the same direction when they fall on a __________ surface.
3. __________ bees rotate around themselves in the form of number 8 pattern.

(B) Mention an example for each of the following:

1. Force that slows down the movement of objects. (__________)
2. A dolphin's super sense. (__________)
3. A body that forms a shadow. (__________)

4 (A) Write the scientific term:

1. It is a simple code that consists of long and short beeps or flashlights. (__________)
2. Animals with large eyes that collect and reflect light back to get clearer picture of their surroundings. (__________)

(B) Review each statement below and decide if it describes a change in position, a change in both position and direction, or neither. Write the appropriate abbreviation in the space to the left of each statement.

P = change in position **PD = change in position and direction**
N = neither

__________ A soccer ball is kicked.
__________ A glass sits on a table.
__________ A rocket is shot up into the air then falls to the ground.
__________ A moving train turns north.
__________ A bus travels 50 kilometers in a straight line.
__________ A sailboat moving forward is pushed left by a gust of wind.

Assess your performance __________

From 1% to 50%	From 51% to 65%	From 66% to 85%	From 86% to 100%
Weak	Fair	Good	Exceeds expectation

December Guiding Models

Model 1

Answer Guide: P. 14

(Total mark) 30

1 **(A) Complete the following:**

1. The glow of the luminous beetles is a type of .... reaction occurring in their bodies.
2. .... prevents your body from rushing forward when accidents happen.
3. The bodies that move at high speeds travel a specific distance in .... time.

(B) Correct the underlined words:

1. A ball's <u>potential</u> energy increases as it slides down an inclined surface. (............)
2. Fish breathe through their <u>moist skin</u>. (............)

2 **(A) State whether each of the following statements is "True" or "False":**

1. "Kilometer/Hour" is the only measuring unit of speed. (............)
2. Animals and humans send and receive information through different systems. (............)
3. When 2 fast-moving bodies collide, they exchange energy. (............)

(B) Match each item in column (B) to what suits it from column (A):

(A)	(B)
1. The energy stored in fuel is	a) directly proportional to its kinetic energy.
2. Speed is the	b) the force applied on the moving body decreases.
3. The kinetic energy decreases as	c) chemical energy.
4. The mass of a moving object is	d) rate of change of distance per unit time.

1. .... 2. .... 3. .... 4. ....

3 **Tick (✓) the correct answer:**

1. There is a similarity between food and fuel, as they both store ______________ energy.
   - chemical potential energy
   - elastic potential energy
   - gravitational potential energy
   - kinetic energy
2. ______________ is the phenomenon that happens when the light bounces off a smooth surface.
   - Shadow
   - Light reflection
   - Light refraction
   - Translucent
3. As the roller coaster slides down an inclined surface, its ______________.
   - potential energy decreases
   - kinetic energy decreases
   - potential energy increases
   - kinetic energy increases
4. Speed = ______________.
   - $\frac{\text{Distance}}{\text{Time}}$
   - $\frac{\text{Distance}}{\text{Mass}}$
   - $\frac{\text{Time}}{\text{Distance}}$
   - $\frac{\text{Mass}}{\text{Time}}$
5. Cows have ______ stomach(s), while humans have ______ stomach(s).
   - 2 - 1
   - 4 - 1
   - 1 - 4
   - 1 - 2

4 **(A) Write the scientific term for each of the following:**

1. It is the time interval between receiving a signal from the environment and reacting to it. (______________)
2. Energy can neither be created nor destroyed. (______________)

(B) Look at the opposite figure, then answer:

1. Arrange the race cars approaching the finish-line, concerning their kinetic energy ascendingly.

____

____

____

FINISH

1 2 3

2. Which car will cause the greatest damage if it collides with another body?

____

Assess your performance

From 1% to 50%	From 51% to 65%	From 66% to 85%	From 86% to 100%
Weak	Fair	Good	Exceeds expectation

Model 2

Answer Guide: P. 14

(Total mark) 30

1 Complete using the given words:

(kinetic – diaphragm – large openings – increases – structural – decreases – Energy – thermal)

1. ________ is the ability to do work.
2. As the time is taken to travel a specific distance increases, the speed of the moving body ________ .
3. Rubbing your hands changes ________ energy into ________ energy.
4. ________ is the muscle that moves downwards during inhalation & upwards during exhalation.
5. The effect of collision increases when the mass of the body ________ .
6. Adaptations are classified into two types: ________ and ________ .
7. Cheetah's nose ________ help it breathe a lot of air during running.

2 (A) Tick (✓) the correct answer:

1. When the distance traveled in a specific time ________, the speed will increase.
   - ☐ remains constant
   - ☐ decreases
   - ☐ increases
   - ☐ no correct answer
2. The form of energy that we gain from food is the ________ energy.
   - ☐ sound
   - ☐ chemical
   - ☐ heat
   - ☐ electric
3. To calculate the speed of a moving body, we need to know the ________ .
   - ☐ temperature, time is taken, and distance traveled by the moving object
   - ☐ time taken and distance traveled by the moving object
   - ☐ temperature and distance traveled by the moving object
   - ☐ distance traveled by the moving object only

(B) Write the scientific term for each of the following:

1. The change in the living organism's behavior allows it to survive in its habitat. (..........)
2. The waves that travel through the air in a straight-line causing vision. (..........)

3 (A) State whether each of the following statements is "True" or "False":

1. Gravity is the force that acts to push objects away from the Earth's surface. (
2. Walking 400 meters to school is faster than driving a car to school. (

(B) Match each item in column (A) to what suits it from column (B):

(A)	(B)
1. Pushing the gas pedal	a) its potential energy increases.
2. When an object stops moving.	b) the kinetic energy will decrease.
3. As the mass of an object decreases,	c) increases the car's speed.

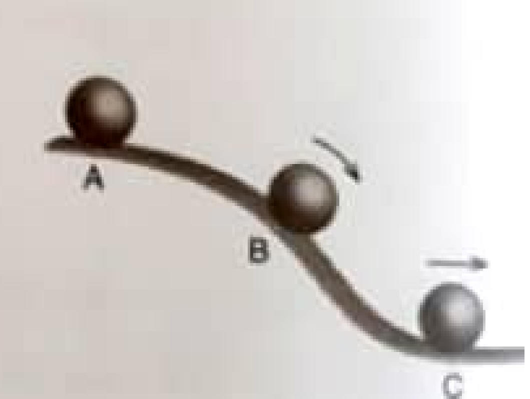
1. .... 2. .... 3. ....

4 (A) Mention whether each of the following adaptations is a "Structural" or "Behavioral" adaptation:

1. Owls can rotate their heads in all directions. (..........)
2. The Jerboa's hairy feet allow it to hold sands. (..........)

(B) Look ok at the opposite figure, then answer:

- The ball at point (A) has high .... energy.
- The ball at point (B) .... energy is changing into .... energy.
- The ball at point (C) has high .... energy.





Model 3

Answer Guide: P. 15

(Total mark) 30

1 (A) Complete the following:

1. Cactus has ________ to prevent animals from eating it.
2. When objects fall down, ________ energy changes into ________ energy.
3. ________, ________ and ________ energies are produced during collision.

(B) Correct the underlined words:

1. As the mass of an object increases, its speed will decrease. (________)
2. When 2 bodies collide with each other, the energy remains constant in between the 2 bodies. (________)

2 (A) State whether each of the following statements is "True" or "False":

1. As the time to travel a specific distance increases, the speed increases. ( )
2. The ear collects sound waves then the nerves send signals to the brain to translate these waves. ( )
3. When a fast-moving motorbike hits the traffic signal board, the signal dashboard will lose all its kinetic energy. ( )

(B) Write the scientific term for each of the following:

1. The type of adaptation that helps animals hide from predators. (________)
2. The force that pulls objects towards the Earth's surface. (________)

3 (A) Tick (✓) the correct answer:

1. Which of the following materials (media) does not allow the light to pass through? ________

- Wood
- Air
- Water
- Glass

2. Spines in the cactus are a/an ________ adaptation.

- unidentified
- behavioral
- structural
- no correct answer

3. What happens when the driver hits the brakes and stops suddenly? ________

- The passenger rushes forwards.
- The passenger rushes backwards.
- The passenger remains stable.
- No correct answer.

(B) Laila walked 15 kilometers in 3 hours, while her friend Sara walked 20 kilometers in 8 hours. Calculate the speed of Laila and Sara, then mention whose walking speed is faster.

____

____

____

____

4 **(A) Look at the opposite figure then answer:**

- Mention the energy transformations in each:
  - At point (A): ________.
  - At point (B): ________.
  - At point (C): ________.

(A) (B) (C)

(B) Give a reason:

The potential energy of a man standing on the top of the hill is greater than his potential energy down the valley.

____

____

Assess your performance

From 1% to 50%	From 51% to 65%	From 66% to 85%	From 86% to 100%
Weak	Fair	Good	Exceeds expectation



Answer Guide: P. 15

(Total mark) 30

1 (A) Complete the following:

1. The penguin's body is covered with .... except its ....
2. In a car race, 2 cars arrive at the finish line at the same time, this means that they have the .... speed.
3. When the first sphere (ball) of Newton's pendulum is lifted up it stores .... energy.
4. While operating an electric fan, the .... energy changes into .... energy.

(B) Explain how a driver can increase and decrease the speed of his car.

....

....

....

2 (A) State whether each of the following statements is "True" or "False":

1. The larger the vehicle, the larger the engine, the more fuel is consumed. (................)
2. Crystal is an opaque material, while the wall is a transparent material. (................)
3. Time is the only factor that affects the speed of a moving object. (................)
4. Sound energy is the only energy produced during collision. (................)

(B) What happens if ...?

- A huge tractor hits (collides) a car moving at the same speed.

....

....

3 (A) Correct the underlined words:

1. <u>Objects in motion</u> do not have any kinetic energy. (................)
2. Dogs' and cows' digestive systems have <u>similar</u> structures. (................)

(B) Write the scientific term for each of the following:

1. Animals that are active during night. ( )
2. It is the crash (or strike) that happens between objects, causing great energy transfer between these bodies. ( )
3. The length of the path traveled by a moving body. ( )

4

(A) Mention an example for each of the following:

1. An opaque material.

____

2. A behavioral adaptation in plants.

____

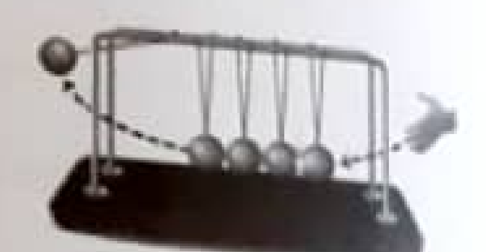
3. Chemical energy changes into kinetic energy.

____

(B) Look at the opposite figure, then answer:

- Explain how the energy transfers during the motion of Newton's cradle.





____

____

____

____

____

____

Assess your performance

From 1% to 50%	From 51% to 65%	From 66% to 85%	From 86% to 100%
Weak	Fair	Good	Exceeds expectation



Answer Guide: P. 15

(Total mark) 30

1 Complete the following sentences:

1. Cutting down forests and eroding soils are from the environmental changes that happen due to ________ .
2. While operating an air conditioner, the ________ energy changes into ________ energy.
3. The measuring unit of speed is ________ or ________ .
4. When a car stops suddenly, the passenger will rush ________ .
5. As the bridge inclination ________, the speed of the car increases.

2 (A) Tick (✓) the correct answer:

1. The ________ extends from the brain down through the backbone.
   - spinal cord
   - auditory (ear) nerve
   - olfactory (smelling) nerve
   - optic (eye) nerve
2. If Maha is walking over an inclined road surface, and her mother pushes her. How the pushing force applied on Maha will affect her direction of motion? ________
   - The push didn't affect her speed.
   - The push stopped her motion.
   - The push decreased her speed.
   - The push increased her speed.
3. The car's ________ helps in burning the fuel, and converting the potential energy into kinetic energy.
   - tires
   - car bulbs
   - safety belt
   - engine

(B) State whether each of the following statements is "True" or "False":

1. Polar bear's feet freeze when they walk on ice. (________)
2. A bicycle on the top of the hill stores elastic energy. (________)



Guiding Models

3 **(A) Write the scientific term for each of the following:**

1. It is a required safety device in the car's safety system that operates automatically once the crash sensors detect collision, by inflating extremely with gas to reduce the impacts of collision during accidents. (..........)
2. The energy stored in an object. (..........)
3. The materials that allow most of the light to pass through. (..........)

(B) Arrange the following speeds ascendingly from (1 - 4):

1. The nail's growth speed is 13 cm/year. (   )
2. An airplane travels 400 km/hour. (   )
3. A man walks at an average of 5 km/hour. (   )
4. A car travels 90 km/hour. (   )

4 **(A) If 2 cars traveled 240 kilometers to reach their destination, the Red car took 2.5 hours to arrive, while the White car took 3 hours.**

1. Calculate the speed of the "Red car".

....

....

2. Calculate the speed of the "White car".

....

....

(B) Look at the following figures, then answer:



Fig. (A)



Fig. (B)



Fig. (C)

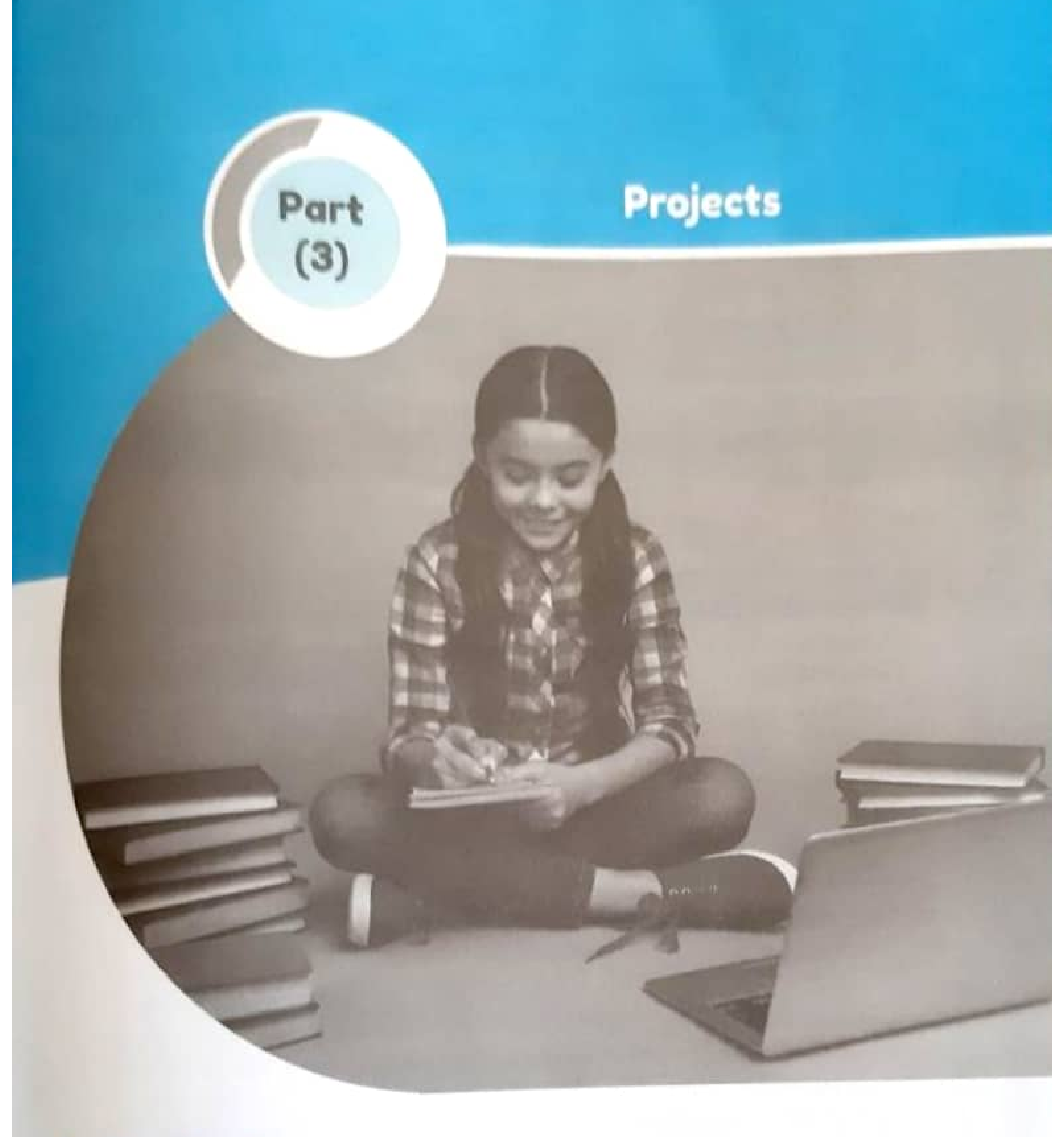
- Arrange the 3 figures regarding their speeds from the highest to the lowest.

....

....

Assess your performance

From 1% to 50%	From 51% to 65%	From 66% to 85%	From 86% to 100%
Weak	Fair	Good	Exceeds expectation



Contents:

- How to prepare the Unit Project
- Unit 1 Project
- Interdisciplinary Project
- Unit 2 Project

How to prepare the unit project:

The first stage
Read the given information.

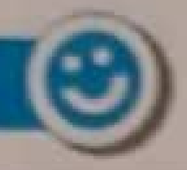
The second stage
Sort the information into main points.

The third stage
Write a suitable introduction to the project topic.

The fourth stage
Write an initial draft contains the main points explained in detail and in a simple language, using pictures, tables, or graphs to support the explanation.

The fifth stage
Write a deductive paragraph for the given information and relate it to the introduction of the research.

Research title



Introduction

Topic elements

Results





Bat Chat

Introduction

Bats live in dark places, such as caves, where there is not enough light to help them see. Bats also fly very fast. They need to be able to avoid flying into walls and other objects. To do this, they have a special adaptation.

Topic elements

Bats use echo in motion.

Bats make a noise in their throats that is very high pitched. It is so high that humans cannot hear it. The noise bounces off objects, a process called **"echoing"**. Bats hear the echo with their ears. They use the echo to figure out where objects are. This way, they can avoid flying into objects. This is called **"echolocation"**.



Bats use echo in hunting.



Bats also use echolocation to hunt. They make a noise, and the noise bounces off prey. Bats can find even tiny prey this way. For example, many bats eat mosquitoes. Although mosquitoes are very small, bats can find them with sound.

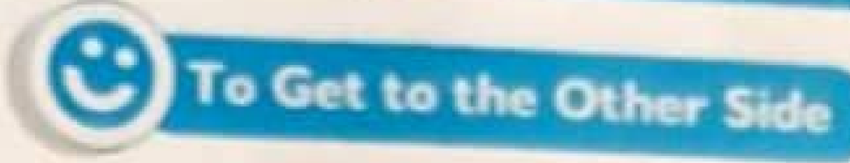
Chattering Bats

Bats make different sounds that mean different things, just like people communicate with words. Researchers use recording devices that can measure the sound. They have decoded many of the sounds bats make and have found that most of the sounds are arguments. Bats argue almost constantly. They argue about food. They argue about where they get to sleep. They argue about which bats they get to have as mates.

Results

- Bats live in caves, so they adapt to the darkness using echolocation to hunt and move.
- Bats use sound to communicate with each other as a language of dialog, not just for hunting and moving.

Interdisciplinary project



How Can You Help "Blue Sinai Agama" Survive?

Follow the given instructions to help you do your interdisciplinary project:

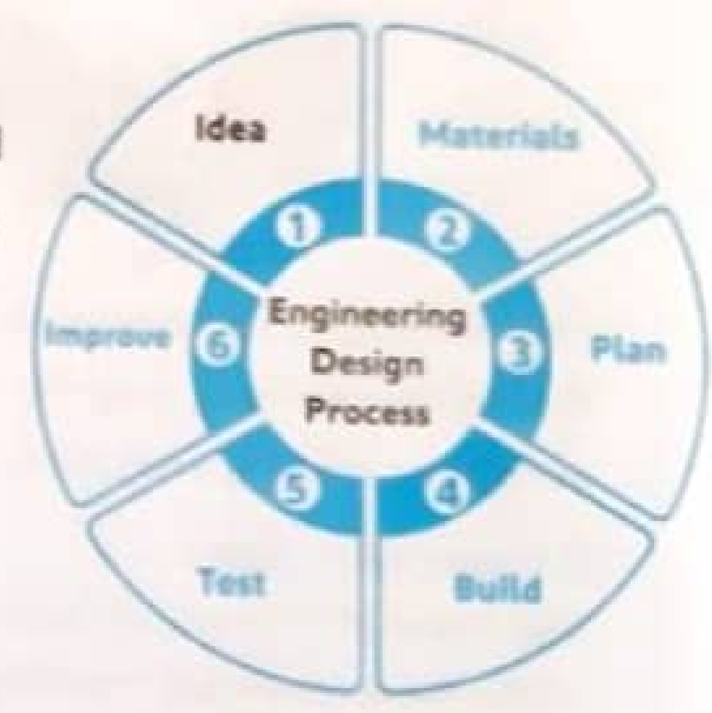


In this project you will...

- Use your Science, Mathematics, Social Studies & Writing skills to find a solution to a real-world problem.
- You will begin by reading the given fictional story about a group of "STEM Solution Seekers".



- You will study some background information, and you will go through the steps of the "Engineering Design Process".
- You will also do some additional work in your Mathematics class related to this challenge.



This project will challenge you to..

- Think about all the community members & how human activities can affect other living organisms.



To Get to the Other Side

"Wildlife Protection"

Read & Think:



- A group of fictional friends (STEM Solution Seekers) went to Sinai in their mid-year holiday with their families as they usually do every year. But, during this trip they noticed that they couldn't find any of the beautiful "Blue Agama Lizards".

Think!!

- Have you ever noticed a change in types or numbers of animals or plants you see in a specific place? What do you think caused the change?

....

- They kept wondering "Where did all the Blue Agama Lizards go?" and poking the sand & gravel there searching for them at the edge of the sidewalk, till they came back to their parents from their walk.
- One of their parents is a Professor of Sciences, they all rushed to him asking "Where did all the Blue Agama Lizards go?", there were plenty of agamas in this region last year before installing the New, Wider Sidewalk, but we can't find them anywhere now!

Think!!

- Do you think, the New Wider Sidewalk is the reason behind the disappearance of the Blue Lizard Agama?

☐ Yes ☐ NO

- One of the kids, was wondering, although sidewalks are very useful for everyone, where we can walk, ride bikes & help keep us safe; but "What if we get rid of the newly installed sidewalk & will these blue agamas will come back?"

- The professor asked the kids, what else did you notice different during your walk in the area? The kids kept thinking for few minutes then one of them replied "I think the rocks in the area were much less than they were in our last visit, before sidewalk was widened".

Think!!

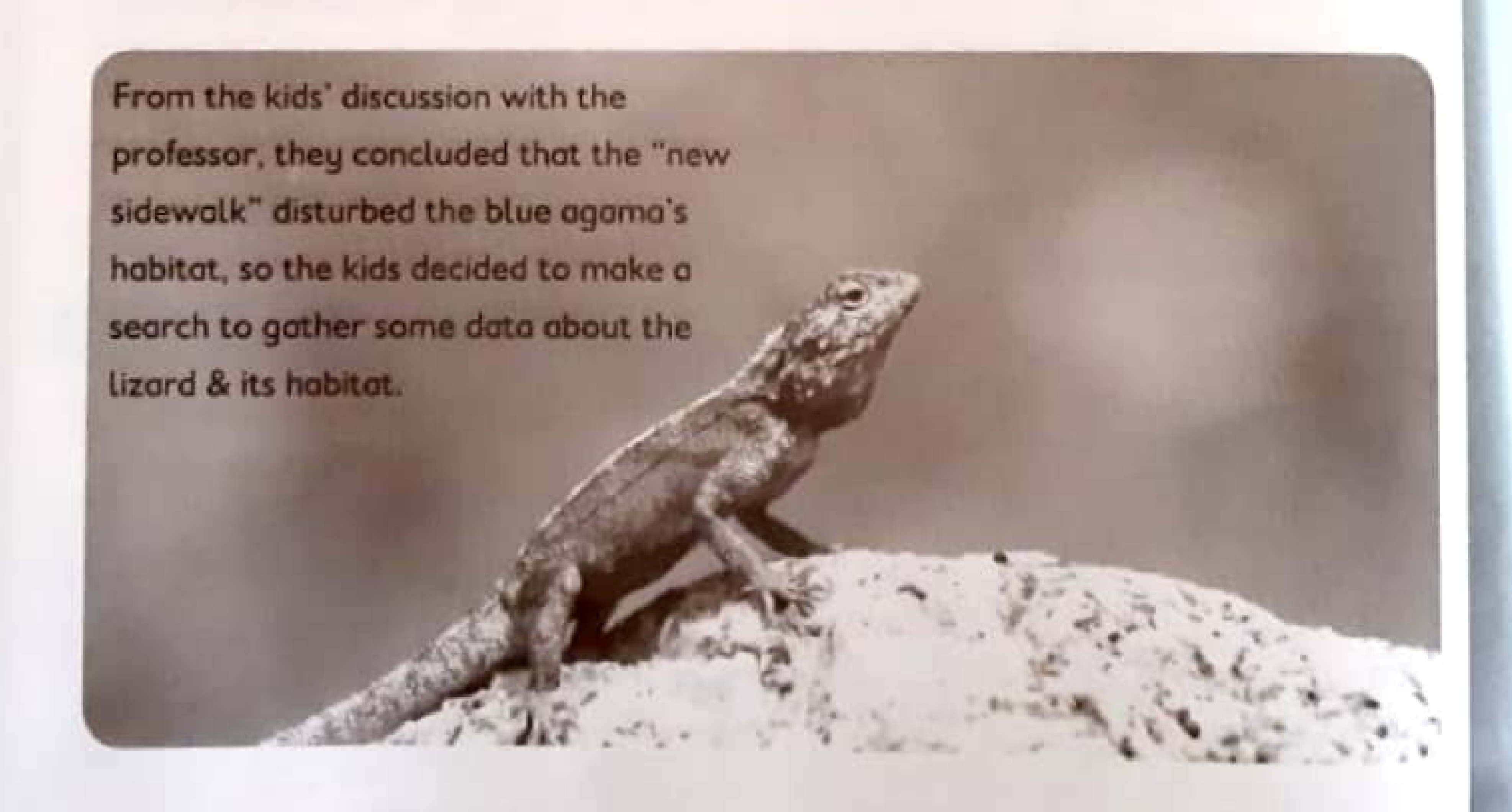
- What is the benefit of the new sidewalk?

....

....

- Do you think, that the greater number of rocks existed in the area before the sidewalk was widened is a reason behind the disappearance of the blue agama?

☐ Yes ☐ No



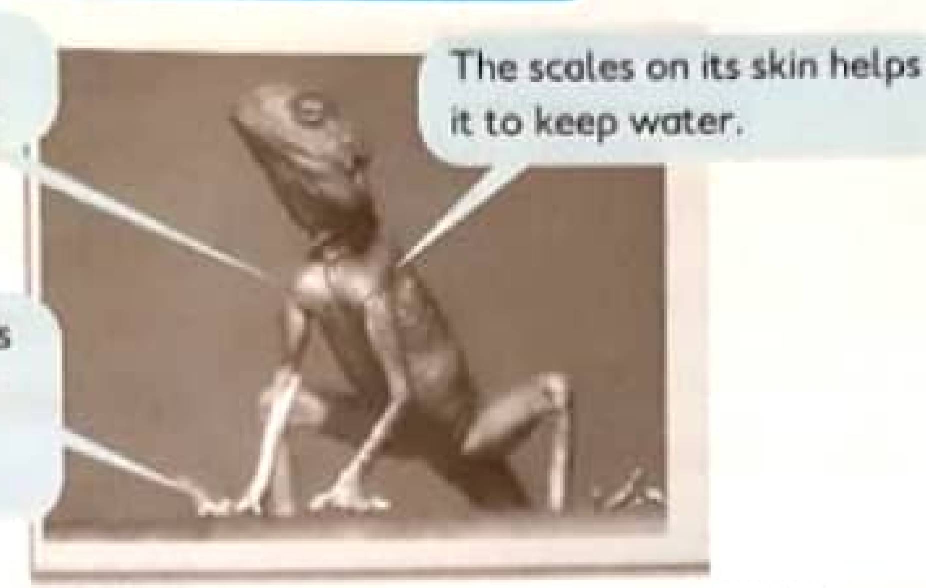


About "Blue Sinai Agama"......

Location

- It is located in the dry, rocky environments of Eastern Egypt.

Adaptations developed to help in their survival



Diet

- Its diet consists of ants, grasshoppers, beetles, termites and other insects only.
- Its tongue surface is as sticky as a bubble gum, that allows lizard catch & hold onto its prey.

Activity

- It is active during the hottest times of the day.
- It likes to hangout in areas with many rocks, hard gravel surfaces, and volcanic boulders (rocks).
- It saves energy as they hide & wait between rocks till their prey comes nearby so that they attack.

Mating

- In the breeding (reproducing) season during late spring:
  - **Males**: turn into a vivid blue color in order to attract a mate.
  - **Females:** Remain the grey-brown color that helps to camouflage in the desert.

Agamas are Endangered

- The number of Sinai Agama lizards is negatively affected by humans, either by changing their natural habitats or catching them, to be sold as pets.



"To help our community, by creating a solution for the sidewalk design that meets the needs of both humans & Sinai Agama Lizards".

Objectives:

- Review the Challenge requirements & needs of Sinai blue agama.
- Assign group members roles.
- Sketch 3-4 brainstorming sketches.
- Decide one final design for your prototype (model or sample).
- Create the prototype of your solution that helps the Sinai blue agama return to their habitats.
- Reflect (or review) & present your product and your process.

Design Requirements:

- [ ] Diagram
- [ ] Prototype
- [ ] Presentation (sharing the product & the process)

Sketching design

Sketch 1



Sketch 2



Sketch 3



Assign the Group Roles:

Job	Team Captain	Materials Manager	Chief Engineer	Team Reporter
Role	• Encourage & support the team. • Help team members & keep track of timeline.	• Gather & organize materials.	• Coordinate the team in building the model safely. • Decide when testing is needed.	• Record the steps of the process. • Share the process.
Member Name	....	....	....	....

Engineering Design Process:

- Think about & imagine ideas that might help solve the sidewalk problem.
- Sketch different ideas, with respect to the needs of both Humans & Sinai Agama.
- Decide which design fits the project's requirements.

- With the Materials manager, gather the following materials:
  - Building materials (such as, craft sticks or small paper of wood.
  - Construction paper or cardboard.
  - Pebble (gravel), small rocks and/ or clay.
  - Sand, small sticks, leaves & dirt.
  - Blank paper or poster.
  - Optional: Toy animals (living organisms models).

- Gather the materials.
- Use the chosen sketch to create a separate diagram with additional details to be used as a blueprint for your prototype.

- With the chief Engineer, start building your prototype.

- Once your prototype is complete, the chief engineer will start testing process to know whether the model working perfectly or it needs improvements.

- If your prototype testing results showed that it needs any improvement, go ahead and start working on the reported issue.

Friendly Advice!!

- Do not panic when you run into problems or challenges, just focus on one problem at a time, then use your creativity & collaborative skills to find solutions to continue your building process.
- Engineers document problems to troubleshoot when things go wrong so they can look for places to make improvements.

"Applied Model"

INTERDISCIPLINARY PROJECT APPLIED MODEL

Analysis & Conclusions:

Sketch 1

- What was your role in the team?

I was Materials manager.

- Did your solution meet humans & Sinai Blue Agama's needs?

☐ Yes ☐ No

- How did you know your design was successful?

I was keen to offer the suitable habitat for Sinai agama, based on the collected data about this lizard, and I also offered humans a safe environment friendly sidewalk. It's hard to know immediately.

- In case your group design needs improvement, what would you improve?

I would add to the sidewalk design some greenery pots and a semipermeable cover to prevent the sand from bothering our eyes when its windy.

"Analysis & Conclusions:"

Sketch ....

Sketch

ANSWER YOUR MODEL

- What was your role in the team?

....

....

....

Did your solution meet humans & Sinai Blue Agama's needs?

☐ Yes ☐ No

- How did you know your design was successful? How did you (or Chief engineer member) test it?

....

....

- ....

In case your group design needs improvement, what would you improve?

....

....

....

Solve Problems Like a Scientist

Unit 2 project.

Vehicle safety

Introduction

Car makers design vehicles for maximum safety, but how do they know what happens to cars during different types of crashes? Is it possible to design cars that are safe in all types of crashes?

- Common safety features on cars include seat belts, airbags, headrests and ABS.
- Modern technology can help to keep passengers and drivers safe.

Topic elements

- **The importance of airbags as a safety system for cars:**

When you travel by car and it suddenly stops, the forward force of the car's motion continues to act on the passengers. You may have seen a video of a car using a mannequin, where it looks as if the person is flying forward. Most of the time, a seatbelt is used to hold the person in place so that they do not hit the steering wheel, dashboard or front windshield of the car. Sometimes, however, a seatbelt is not enough to protect the passengers.

- **The mechanism of action of the airbags and their effect during a collision:**

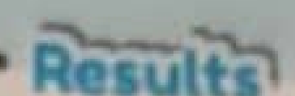
Airbags have been added to many cars in both the front of the vehicle as well as in the side doors to help protect people inside during a collision or a sudden stop. These airbags are folded up inside the framing of the car and are activated by a sudden change in direction or motion, or by the impact of a collision or crash. Airbags are designed to cushion the passengers so that they do not hit any of the hard objects inside the car or fly forward outside of the vehicle.

- **Ways to develop airbags to reduce their negative effects**

Although the function of airbags is to save the lives of drivers, they may cause severe injuries to them in the face or chest. Where a malfunction in the sensor causes the airbags to be released at an inappropriate time, such as the car passing over a sudden bump or not opening the airbags when accidents occur. Some car companies have developed airbags so that they are installed to the right of the driver, so they fill the space between the driver and the passenger next to him, which reduces their collision with each other. The design has also been simplified and the weight of the airbag components has been reduced, making it more efficient and flexible.







1. There is no safe car design for all types of crashes, so car manufacturers are always looking to develop car protection methods.
2. There are a lot of car protections such as seat belts, airbags, head restraints, and ABS.
3. Airbags have advantages and disadvantages.



Search the internet

Using the Internet search about the safety features invented by car engineers to protect the drivers and passengers that may include:

- Blind Spot Monitoring System.
- Driver Override Technology.
- Pedestrian Identification System.
- Night vision system.
- Traffic sign recognition system.

Your research should describe:

1. A plan to develop this feature.
2. How the impact of a collision will trigger the device to activate and which riders in the car would benefit from its protection.
3. The methods you plan to use to test this feature.
4. Modifications you would make to improve your device using technology or other innovations.
5. The types of crashes the device best protects against, the direction of the forces involved in these crashes, and the ways the feature counteracts them.
6. Discuss at least one way this safety feature could be improved.

AL ADWAA

Gem

SCIENCE

Model Answers

FIRST TERM

4th PRIM.

2022

GEM Science

Model Answers



4th Prim.

First Term

Prepared by

A Selected Group of Specialists

First: The Main Book

Unit 1 Living Systems

P. 10

1 Adaptation and Survival

Apply Like a Scientist P. 15

Activity (1)

1. (c) 2. (b) 3. (b)

Activity (2)

1. (a) 2. (a) 3. (b)

Activity (3)

1. desert 2. white thick fur
3. Camouflage

Activity (4)

A 1. (c) 2. (a)

B Because it helps it to hide among sand in its habitat.

C
1. Structural adaptation.
2. Structural adaptation.
3. Behavioral adaptation.
4. Structural adaptation.
5. Behavioral adaptation

Activity (5)

1. The wide mouth opening
2. The coiled tail
3. Its eyes that see in different directions at the same time.
4. Vivid colorful scales

Activity (6)

1. (✗) 2. (✓) 3. (✓) 4. (✓) 5. (✓)

Activity (7)

1. (d) 2. (b) 3. (a) 4. (c)

Activity (8)

1. adapt 2. deep, branched
3. wide 4. Thorns
5. structural, behavioral
6. shortage

Activity (9)

A 1. (c) 2. (b) 3. (a) 4. (c)

B
1. Digestive system
2. Tongue
3. Esophagus
4. Gastric juice

Activity (10)

1. (✗) 2. (✗) 3. (✓) 4. (✗)

Activity (11)

A
1. oxygen, carbon dioxide
2. nose, pharynx, trachea, 2 bronchi, 2 lungs
3. downwards, upwards

B 1. (✓) 2. (✗) 3. (✗)

Activity (12)

1. structural 2. oxygen, carbon dioxide
3. gills

Activity (13)

1. negative
2. positive
3. pollutants
4. natural, human activities

Al-Adwaa P. 20
Exercises on Wonder Activities

1 1. (a) 2. (b) 3. (b)

2 1. (b) 2. (c) 3. (a)

3 1. Antarctica 2. desert
3. brown

4 1. False 2. False 3. True 4. True

Al-Adwaa Exercises on Learn Activities

P. 48

1 1. (d) 2. (a) 3. (b) 4. (c)

2 1. False 2. False
3. False 4. True
5. True

3 1. water pollution 2. gastric juice
3. diaphragm 4. small intestine
5. structural

4 1. Behavioral adaptation
2. Respiratory system 3. Alveoli

5 a. Shelter b. Food

6 Referring to concept one in the main book will guide you.



P. 56

1 1. (b) 2. (d) 3. (a) 4. (c)
5. (d) 6. (d) 7. (a) 8. (d)
9. (d) 10. (a) 11. (a) 12. (b)
13. (d) 14. (b)

2 1. structural, behavioral
2. warmer, cooler
3. lower, hearing, long, short
4. structural 5. mouth, anus
6. six 7. oxygen, blood vessels
8. bronchioles
9. blood vessels 10. dissolved, gills
11. floods, change in temperature, forests burning
12. water pollution, negatively

3 1.(✗) 2. (✓) 3. (✗) 4. (✓)
5. (✗) 6. (✗) 7. (✓) 8. (✗)

4 1. Buttress roots 2. Diaphragm
3. Inhalation 4. Small intestine
5. Esophagus 6. Nose

5 1. Their body temperature decreased in the extreme hot climate.
2. It opens its mouth widely, puffs its body with air, changes its scales color.
3. a. Changing the nature of the plants that we depend on them in feeding.
b. Decreasing or increasing the number of predators and prey.
c. The displacement of the original plants and animals for centuries.
4. Carbon dioxide is ejected out during exhalation process.
5. The body parts will not get oxygen to perform their vital process, leading to death.

6 1. Because the blood vessels that transfer throughout the body carry warm blood, and they touch the cooler blood vessels, then heat transfers to them.
2. To soak up light as much as possible.
3. To protect themselves from plant eaters.
4. Because it causes breathing difficulties such as lungs damage, heart and asthma diseases.

7 1. Fix the plant in the soil and absorb the underground water.
2. Protect the tree from plant-eaters.
3. Absorb light as much as possible.
4. Allows food to pass from the pharynx to the stomach.
5. Stores the undigested food in it and absorbs water from the undigested food.
6. Extract the dissolved oxygen in the water which is important for respiration.
7. Gases exchange occurs within.

8 A. digestive system:
1. Mouth 2. Pharynx
3. Esophagus 4. Stomach
5. Large intestine
6. Small intestine
7. Anus

B. 1. Nose 2. Pharynx
3. Trachea 4. Bronchioles
5. 2 Bronchi 6. Alveoli
7. Two lungs 8. Diaphragm

9 1. Structural adaptation.
2. Behavioral adaptation.
3. Structural adaptation.
4. Behavioral adaptation.
5. Structural adaptation.
6. Behavioral adaptation.
7. Structural adaptation.
8. Behavioral adaptation.
9. Structural adaptation.
10. Behavioral adaptation.



Senses at Work

Apply Like a Scientist P. 62

Activity (1)

1. (a) 2. (c) 3. (b) 4. (d)

Activity (3)

1. (✓) 2. (✗) 3. (✓) 4. (✓) 5. (✓) 6. (✓)

Activity (4)

1.

Used sense	Purpose	Examples
sound and sight	Identifying objects	Dolphin
smell, taste and sight	Distinguishing spoiled food	Human
sight and smelling	Hunting	Tiger

2. brain

Activity (5)

1. (b) 2. (a) 3. (c) 4. (c)

Activity (6)

1. brain 2. Nerves 3. nervous system

Activity (8)

1. Reaction time 2. Back long legs
3. Ears

Activity (10)

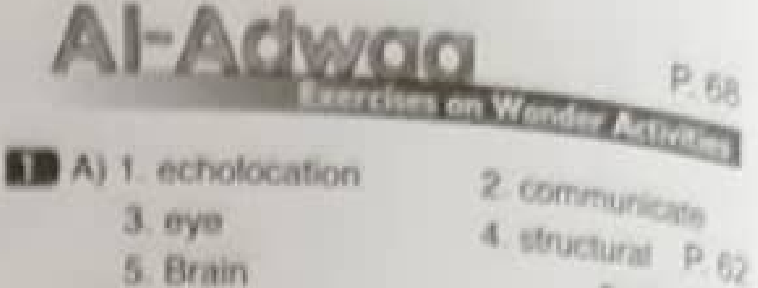
The flashing light, because the brain processes what we see faster than what we hear.

Activity (11)

1. Sense organs 2. Brain
3. Reflex action
4. gathering information through sense organs, processing information, tell the body what to do

Activity (12)

pain, hot, cold, harm



P. 68

1 A) 1. echolocation 2. communicate
3. eye 4. structural P. 62
5. Brain 6. sight
B) 1. (d) 2. (c)
3. (b)
C)



Sight
Smell
Hearing
Taste
Touch

Al-Adwaa — Exercises on Learn Activities P. 84

1 1. (c) 2. (a) 3. (c)

2 1. False 2. True
3. True 4. False

3 1. Ear 2. Sensory organs - nerves
3. spinal cord 4. body systems
5. hearing

4 1. Nocturnal animals 2. Reaction time

5 a) 1. Brain 2. Spinal cord 3. Nerves
b) the brain



P. 89

1 1. (a) 2. (b) 3. (b)
4. (a) 5. (b) 6. (a)
7. (d)

2 1. nocturnal 2. far
3. eyes-ears - nose - skin - tongue
4. Brain
5. brain - spinal cord-nerves
6. faster 7. smelling
8. hear low sounds

3 1. (c) 2. (a) 3. (d)
4. (e) 5. (b)

4 1. (✓) 2. (✗) 3. (✓)
4. (✗) 5. (✗) 6. (✗)

5 1. Echolocation 2. Nose
3. Brain 4. Snakes
5. Brain 6. Reflexes

6 1. Jerboa's receptors in its ears send messages through nerves to the brain which alert its legs and jumps quickly.
2. The external information (sharp thorns) is transferred by nerves from hand to brain that translates information and sends response to the hand to feel pain and move the hand away.
3. Blinking eyes as a reflex.

7 1. True 2. False
3. False 4.True

8 2 - 1 - 4 - 3

Concept 3 Light and Sight

Apply Like a Scientist P. 97

Activity (3)

(b)

Activity (4)

1. (✓) 2. (✗) 3. (✓) 4. (✓)

Activity (6)

1. Light falls on the objects.
2. Light reflects in a straight line into our eyes.
3. Eye sends a message to the brain through nerves.
4. The brain tells you what we see.

Activity (8)

1. Metallic spoon-Mirror-Aluminum foil
2. Shiny 3. Same

Activity (9)

1. transparent - opaque 2. smooth
3. rough

Al-Adwaa P. 98
Exercises on Wonder Activities

1 1. allow 2. nocturnal 3. structural

2 1. night vision devices 2. fire
3. cats – humans 4. falls – reflects

3 1. True 2. False
3. True 4. False
5. True 6.False

Al-Adwaa P. 110
Exercises on Learn Activities

1 1. larger 2. tapetum lucidum
3. very large 4. piece of wood
5. structural

2 1. False 2. True
3. True 4. True

3 1. illumination 2. light reflection
3. clear glass – carton paper
4. straight 5. smoothness

4 1. tapetum lucidum 2. rough surface
3. transparent

5 a. The light rays are diffused in different directions.
b.



Al-Adwaa 3
Exercises on Concept P. 117

1 1. (c) 2. (a) 3. (a)
4.(c) 5. (a) 6. (c)
7. (b) 8. (b) 9. (a)
10. (a) 11. (b) 12. (c)
13. (b)

2 1. fishing
2. insects - small - lizards - birds
3. structural
4. sun – fire – flashlight
5. transparent – opaque
6. bigger

3 1. (c) 2. (a) 3. (d) 4. (b)

4 1. (✗) 2. (✗) 3. (✓) 4. (✓) 5. (✗)

5 1. sun 2. rough
3. an opaque 4. light
5. cats

6 1. tarsier 2. light reflection
3. light energy 4. transparent
5. opaque

7 1. glass 2. wood
3. cats 4. foil paper
5. sun

8 1. Because it reflects the sunlight on its surface.
2. Because without light bouncing off the object into our eyes, everything will look black.
3. Because water allows light to pass through, while wood doesn't allow light to pass through.

9 1. We can't see anything.
2. The light rays are diffused in different directions.
3. The light rays are reflected in one direction.

10 1. Smooth 2. One



Concept 4 Communication and Information Transfer

Apply Like a Scientist P. 124

Activity (2)

1. chemical reaction 2. light

Activity (3)

1. 700 2. Chinese

Activity (4)

Human communication methods	Animals communication methods
• Using traffic light • Using mobile phone • Using the internet • Writing.	• Meowing • Hearing echo to get food.

Activity (5)

1. (d) 2. (a) 3. (c)

Activity (6)

1. Hieroglyphic writing 2. Eyes
3. code

Activity (7)

1. Morse code 2. flashes, dashes
3. information 4. alphabet letters

Activity (8)

1. (✗) 2. (✓) 3. (✗) 4. (✗)

Activity (9)

1. communication system
2. satellite - communication towers - software
3. cell phone - internet - cable TV.

Activity (10)

1. (✗) 2. (✗) 3. (✓) 4. (✗)

Al-Adwaa Exercises on Wonder Activities P. 128

1 1. (b) 2. (a)

2 1. papyrus 2. chemical reaction
3. Bats 4. Babylonians

3 1. True 2. True 3. False

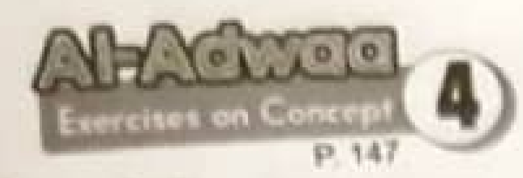
Al-Adwaa Exercises on Learn Activities P. 140

1 1. Language
2. long and short beeps
3. smelling 4. Nervous

2 1.(True) 2. (True) 3. (True)
4. (False) 5. (True)

3 1. code 2. Lighthouses
3. facial expressions
4. a little far - very far away.

4 1. Code 2. Communication systems



Al-Adwaa Exercises on Concept 4

P. 147

1 1. (b) 2. (b) 3. (b) 4. (c)
5. (a) 6. (c) 7. (a) 8. (c) 9.(c)

2 1. Babylonians 2. musical notes
3. 8-food
4. Internet - Cable TV.

3 1. (c) 2. (d) 3. (b) 4. (a)

4 1. (✗) 2. (✗) 3. (✓)
4. (✗) 5. (✗)

5 1. regular 2. communication
3. useful

6 1. Fire flies 2. Code
3. Communication system

7 1. Bee 2. Ant
3. Morse code 4. Fireflies

8 1. Predators will attack them easily.
2. They can't find the food places.
3. They can't get their food.
4. Sailors can't determine their locations.
5. Car accidents and traffic jam will occur.

9 1. Due to the chemical reaction occurs inside its body.
2. Due to the technological methods such as a cell phone and internet.
3. Because the season temperature affects the sound pitch.

Unit 2 Motion P. 150

1 Starting and Stopping

Apply Like a Scientist P. 154

Activity (1)

1. Motion 2. Static
3. Motion 4. Static

Activity (2)

1. Decrease 2. Jet engines

Activity (4)

1. Balanced 2. Greater

Activity (5)

1. Push 2. Pull
3. Push 4. Pull

Activity (8)

1. Opposite 2. Friction
3. Equal to

Activity (9)

1. Friction 2. Balanced
3. Unbalanced

Activity (10)

1. Friction force 2. increases

Activity (11)

1. energy - force 2. work

Al-Adwaa Exercises on Wonder Activities P. 159

1 1. less powerful than 2. increases

2 1. force 2. unequal
3. decrease 4. equal

3 1. True 2. False
3. True 4. True
5. True

Al-Adwaa Exercises on Learn Activities P. 171

1 1. move in the same direction
2. increase 3. is larger than
4. opposite

2 1. False 2. True
3. False 4. False

3 1. can 2. warm
3. energy 4. longer
5. gravity

4 1. motion 2. force
3. friction force

Al-Adwaa 1
Exercises on Concept

P. 175

1
1. (c) 2. (a) 3. (a) 4. (a)
5. (c) 6. (b)

2
1. force 2. friction
3. friction 4. gravity
5. move 6. balanced
7. gravity

3
1. (✗) 2. (✓) 3. (✗)
4. (✓) 5. (✓) 6. (✓)
7. (✓)

4
1. motion 2. force
3. friction force 4. energy
5. work

5
1. motion 2. pull
3. force 4. balanced
5. friction

6
1. It can reach speeds of more than 500 kilometers per hour.
2. The chair will move in the right direction.
3. The speed of the bike increases.
4. The speed of the bike decreases.
5. The speed increases and, the object moves a longer distance.

7
1. (b) 2. (a) 3. (e) 4. (c)

8
1. pulling 2. rest
3. pull 4. left
5. increases 6. stay still
7. balanced

Concept 2 Energy and Motion

Apply Like a Scientist P. 180

Activity (1)
(a) and (d) have kinetic energy

Activity (2)
1. (✗) 2. (✗) 3. (✓)

Activity (3)
1. electric 2. kinetic
3. sound 4. Thermal electric
5. radiant "light", thermal "heat"

Activity (4)
First, the kinetic energy is transferred from the bat to the ball,
Then, the ball moves in the air with the produced kinetic energy.
Finally, the ball hits the table and part of the kinetic energy is converted into sound.

Activity (5)
1. (✗) 2. (✗) 3. (✗)

Activity (6)
A
1. Potential energy
2. Kinetic energy

B
1. Potential energy
2. Potential energy, kinetic energy
3. Zero

Activity (8)
1. Potential energy into kinetic energy
2. Electric energy into heat energy
3. Potential into kinetic

Activity (10)
1. Law of conservation of energy
2. Chemical energy
3. Mechanical kinetic energy

Activity (11)
1. solar,electric 2.electric, thermal

Al-Adwaa
Exercises on Wonder Activities

P. 187

1
1. (a) 2. (b)

2
1. potential, motion 2. heat
3. sound 4. electric

3
1. False 2. False
3. False 4. True

Exercises on Learn Activities
P. 201

1 1. (c) 2. (b) 3. (a) 4. (b)

2 1. True 2. False
3. False 4. False
5. True

3 1. potential, kinetic
2. potential, kinetic
3. gasoline, thermal, light
5. burns

4 1. Gravitational potential energy
2. Light energy
3. Law of conservation of energy



P. 210

1 1. (d) 2. (c) 3. (d) 4. (c)
5. (d) 6. (d) 7. (b) 8. (d) 9. (d)

2 1. sound 2. potential
3. electric 4. kinetic
5. heat 6. kinetic, sound
7. electric

3 1. (✗) 2. (✗) 3. (✓) 4. (✓)
5. (✗) 6. (✗)

4 1. Energy 2. Potential energy
3. Kinetic energy

5 1. The chemical (potential) energy stored in the fuel is converted into mechanical (kinetic) energy, then part of it changes into sound and heat energy.
2. The potential energy stored when it goes upwards is converted into kinetic energy during sliding down.

6 1. Because both store chemical (potential) energy that is converted into kinetic energy due to its burning.
2. Because the potential energy increases when the height where an object is placed at increases.

7 1. The ability to do work
2. It is the stored energy in an object due to the work done on it.
3. It is the energy that causes the motion of objects.

8 1. Electric energy, Light and heat energy.
2. Chemical energy, Heat energy.
3. Chemical energy, Kinetic energy.
4. Electric energy, Sound energy.

9 A) 1. (A) 2. (D)
B) Fig.(A): Potential energy
Fig.(B): Chemical energy
Fig.(C): Gravitational energy

10 **First,** The kinetic energy in the man's finger is transferred to the dominoes when he touches them.
Then, the dominoes move as a result of the transfer of the kinetic energy to it.
Finally, the kinetic energy is converted into potential energy when they fall on the ground.



Speed

Apply Like a Scientist
P. 218

Activity (2)

1. sticks 2. smaller than
3. decreases 4. big sized

Activity (3)

1. Distance 2. Time

Activity (4)

The car that moves100 kilometers in an hour as its speed is 100 km/h, so it is the one that exceeds the speed limit.

Activity (5)

1. Speed = Distance/Time
= 600/5 = 120 km/h
2. Speed = Distance/Time
= 100/10 = 10 m/s

Activity (6)

1. False
2. False
3. True

Activity (7)

Answer by yourself

Activity (8)

1. increases
2. direct
3. speed

Activity (9)

1. (✗) 2. (✓) 3. (✗) 4. (✓)

Al-Adwaa — Exercises on Wonder Activities P. 220

1
1. (b)
2. (c)

2
1. Distance, time
2. longer, same
3. decrease
4. slipping, high speed

3
1. True
2. True
3. False
4. False

Al-Adwaa — Exercises on Learn Activities P. 234

1 1. (c) 2. (c) 3. (a) 4. (b) 5. (b)

2
1. Distance
2. Speed

3 Speed = Distance/Time
= 144/3=48 km/h

Al-Adwaa — Exercises on Concept 3 P. 240

1 1. (c) 2. (c) 3. (d) 4. (a) 5. (c) 6. (d)
7. (b) 8. (a) 9. (c) 10. (c)

2
1. Figure (A)
2. Figure (B)
3. Figure (A), Figure (C), Figure (B)
4. decreases, decreases

4 Energy and Collision

Apply Like a Scientist P. 245

Activity (2)

1. (✗)
2. (✗)

Activity (3)

1. Seatbelts
2. nylon
3. sensors

Activity (5)

1. kinetic energy increases
2. sound

Activity (6)

The greater the speed, the greater the kinetic energy.

Activity (7)

A 1. (✗) 2. (✗) 3. (✓)

B Plane

Activity (8)

1. mass
2. more

Activity (9)

1. does not disappear
2. sound
3. before - after

Al-Adwaa — Exercises on Wonder Activities P. 248

1
1. The body with higher energy and speed to the body with less energy and speed.
2. The passenger moves forward.

2
1. tennis racket-tennis ball
2. airbag
3. seatbelt
4. increases

3 1. (✗) 2. (✓) 3. (✗) 4. (✓)

Al-Adwaa Exercises on Learn Activities

P. 261

1 1. (b) 2. (c) 3. (a)

2 1. True 2. True
3. True

3 1. sound energy 2. speed

Al-Adwaa Exercises on Concept 4

P. 267

1 1. (d) 2. (d) 3. (c)
4. (c) 5. (b)

2 1. potential 2. Seatbelts
3. half

3 1. False 2. False
3. False 4. False

4 1. Collisions 2. Airbag

5 1. The potential energy changes into kinetic energy.
2. It will cause more damage.

6 Because it keeps our body from moving forward when collisions occur.

Second: Ongoing Assessment

Unit 1 Concept 1 Assessment

P. 4

1 1. (d) 2. (c) 3. (d) 4. (c) 5. (b)

2 1. Behavioral adaptation
2. thin, spiky, branched
3. Alveoli
4. respire 5. gills

3 1. (e) 2. (a) 3. (d)
4. (b) 5. (c)

4 A) 1. To be able to camouflage in order to hide for hunting.
2. Because the inhaled air is rich in oxygen, while the exhaled air is rich in carbon dioxide.
3. Because it has negative effects on human causing:
a. Breathing difficulties
b. Lungs and heart diseases
c. Asthma disease

while on animals and plants cause:
a. Changing the nature of the plants that we depend on them in feeding.
b. Decreasing or increasing the number of predators and prey.

B) 1. Camouflage 2. Digestion

Unit 1 Concept 2 Assessment

P. 6

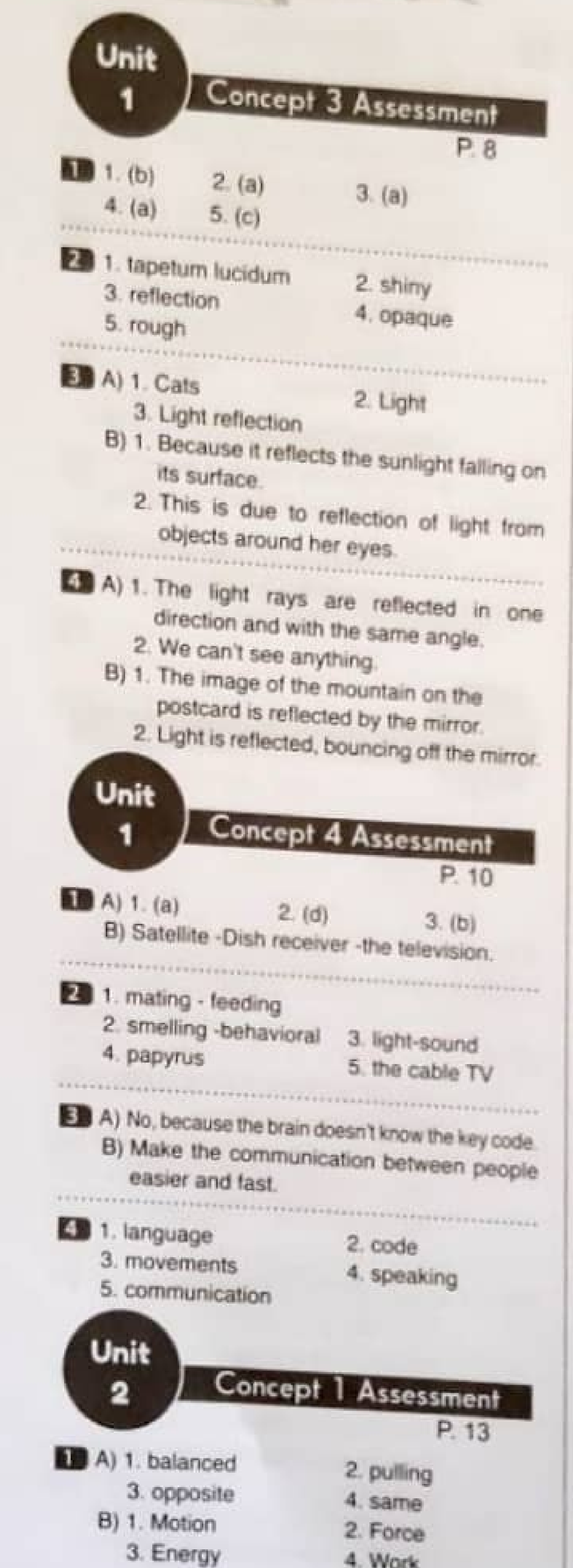
1 1. A) 1. (a) 2. (d) 3. (a)
B) 1. hearing 2. slower

2 1. Brain 2. spinal cord
3. hearing 4. reflex action

3 A) 1. (✓) 2. (✗) 3. (✓) 4. (✓) 5. (✗)
B) 1. They communicate with each other and predators can't attack them.
2. The hand nerves send message to brain which understands the message and sends to the hand to tell it what to do.

4 A) 1. Because they use echolocation to get their food.
2. Because it directs the distant sounds directly into the owl's ears.
3. Due to the nervous system organs that help us to feel and protect us from dangers.

B) 1. Sense organs
2. Nocturnal animals



Unit 1 Concept 3 Assessment

P. 8

1 1. (b) 2. (a) 3. (a)
4. (a) 5. (c)

2 1. tapetum lucidum 2. shiny
3. reflection 4. opaque
5. rough

3 A) 1. Cats 2. Light
3. Light reflection
B) 1. Because it reflects the sunlight falling on its surface.
2. This is due to reflection of light from objects around her eyes.

4 A) 1. The light rays are reflected in one direction and with the same angle.
2. We can't see anything.
B) 1. The image of the mountain on the postcard is reflected by the mirror.
2. Light is reflected, bouncing off the mirror.

Unit 1 Concept 4 Assessment

P. 10

1 A) 1. (a) 2. (d) 3. (b)
B) Satellite -Dish receiver -the television.

2 1. mating - feeding
2. smelling -behavioral 3. light-sound
4. papyrus 5. the cable TV

3 A) No, because the brain doesn't know the key code.
B) Make the communication between people easier and fast.

4 1. language 2. code
3. movements 4. speaking
5. communication

Unit 2 Concept 1 Assessment

P. 13

1 A) 1. balanced 2. pulling
3. opposite 4. same
B) 1. Motion 2. Force
3. Energy 4. Work

2 A) 1. (b) 2. (d) 3. (c)
B) The teams have equal and opposite forces.

3 A) 1. - The sign of the highway telling you the speed limit.
- The light pole you see out the window.
- The parked car that you pass on the road.
B) 1. A force must act upon the object.
2. The position of the object must change.

4 1. remain at rest 2. air force
3. balanced 4. friction
5. pull

Unit 2 Concept 2 Assessment

P. 15

1 A) 1. Energy 2. Potential
3. electric kinetic
B) 1. at rest 2. kinetic

2 A) 1. True 2. True
3. False 4. True
5. False
B) 1. Chemical energy 2. Energy

3 1. (a) 2. (a) 3. (d) 4. (a) 5. (d)

4 A) 1. Chemical energy into kinetic, sound, heat energy
2. Electric energy into heat energy
3. Chemical energy into electric energy
4. Potential gravitational energy into kinetic energy
B) 1. potential
2. potential, kinetic
C) 1. The ball
2 .The ball, because it has more mass and by increasing the mass of an object, the stored potential energy in it increases.

Unit 2 Concept 3 Assessment

P. 17

1 A) 1. fast, slow 2. 90 Km/h
3. very-high, energy
B) 1. decrease 2. heavier
3. decreases

2 A) 1. False 2. True
3. True
B) 1. Speed 2. Distance

3 A) 1. (c) 2. (c) 3. (d) 4. (a) 5. (d)
B) Cyclist (B) has more kinetic energy, because by increasing the angle of inclination of the ramp, the speed increases so the kinetic energy increases.

4 No, because the desert road has uneven ground so it has high friction force that decreases the speed.

Unit 2 Concept 4 Assessment

P. 19

1 A) 1. Airbag 2. more-low
3. sound - heat
B) 1. large 2. Energy

2 A) 1. True 2. True
B) 1. a 2. c

3 1. d 2. e 3. c 4. a

4 A) 1. The yellow car speed = $\frac{240}{2.5} = 96$ kilometers/hour
2. The green color speed = $\frac{240}{3} = 80$ kilometers/ hour

B)

P.O.C.	Green car	Yellow car
Speed	Lower	Higher
Kinetic Energy	Low	More
Car's Engine	Less powerful	More powerful
Fuel Consumption	Less	More

Guiding Models

October Guiding Models

Model 1

P. 23

1 (A) 1. (d) 2. (c) 3. (b) 4. (a)
(B) 1. Structural adaptation
2. Structural adaptation
3. Functional adaptation
4. Structural adaptation

2 (A) 1. Brain 2. Behavioral adaptation
3. Saliva 4. Dolphin
(B) 1. Acacia trees warn each other from large herbivores (ex: Giraffes) from eating their leaves, by pumping toxic substances into their leaves in order to send signals to the other neighboring trees to protect themselves.
2. The hand nerves send signals to the brain to interpret and tell the body what to do.

3 (A) 1. (✗) 2.(✓) 3. (✗) 4.(✓)
(B) 1. slower than 2. Brain
3. echolocation
4. sharp

4 (A) 1. inhalation 2. structural
3. gills
(B) 1. Digestive system
2. a. Esophagus b. Pancreas
c. Small intestine

Model 2

1 (A) 1. (c) 2. (a) 3. (d)
4. (b) 5. (c) 6. (b)
(B) (2) – (1) – (4) – (3)

2 (A) 1. Behavioral adaptation
2. Structural adaptation
3. behavioral adaptation
(B) 1. Long ears 2. sharp thorns
3. dark

3 (A) 1. Reaction time 2. Adaptation
3. Camouflage
(B) 1. B 2. A 3. D 4. C

4 (A) 1. (✗) 2. (✓) 3. (✗) 4. (✓) 5. (✗)
(B) 1. Nervous
2. It is the main control center of the body

November Guiding Models

P. 27

Model 1

1 A) 1. (a) 2. (a) 3. (d) 4. (b) 5. (b)
B) It is a group of devices that work to transfer information from one place to another

2 (A) 1. Code 2. Friction
(B) 1. B 2. C 3. A

3 (A) 1. (✓) 2. (✓) 3. (✓)
(B) (F - C - C - C - F)

4 (A) 1. transparent 2. opaque
3. longer
(B) 1. light flashes
2. fireflies – chemical reaction

Model 2

1 (A) 1. (c) 2. (b) 3. (b) 4. (d)
(B) 1. To be able to see in the dark.
2. Because it reflects the sunlight rays.

2 1. Cuneiform 2. Light reflection
3. Motion

3 (A) 1. (✗) 2. (✓) 3. (✓)
(B) 1. structural 2. transparent
3. Code

4 (A) 1. Sun 2. Wood
3. Glass
(B) - A force is a push or a pull.
- Two forces can be unbalanced.

Model 3

1 1. (d) 2. (C) 3. (d) 4. (b) 5. (b)

2 1. (✓) 2. (✗) 3. (✓)

3 (A) 1. Communication system
2. smooth 3. Scout
(B) 1. Friction 2. Echolocation
3. Wood

4 1. Morse code 2. Tarsier
(B) (P - N - PD - PD - P - PD)

December Guiding Models

P. 33

Model 1

1 (A) 1. chemical 2. seat belt
3. less
(B) 4. kinetic 5. gifts

2 (A) 1. False 2. True
3. True
(B) 1. (c) 2. (d) 3. (b) 4. (a)

3 1. chemical potential energy
2. light reflection
3. kinetic energy increases
4. $\frac{\text{Distance}}{\text{Time}}$ 5. 4 - 1

4 (A) 1. Response time
2. Law of conservation
(B) 1) Car no. 1 - Car no. 3 - Car no. 2
2) Car no. 2

Model 2

1 1. energy 2. decreases
3. kinetic energy - heat 4. diaphragm
5. increases
6. structural - functional 7. slipping

2 (A) 1. increases 2. chemical
3. temperature, time taken and distance travelled by the moving object
(B) 1. Adaptation 2. Light waves

3 (A) 1. False 2. False
(B) - Pushing the gas pedal, increases the car's speed.
- When an object stops moving, its potential increases.
- As the mass of an object decreases, the kinetic energy will decrease

4 (A) 1. structural 2. functional
(B) 1. – The Ball at point (A) → Potential energy
– The Ball at point (B) → potential , kinetic
– The Ball at point (C) → kinetic energy

Model 3

1 (A) 1. spines
2. gravitational potential energy – kinetic energy
3. heat - sound - light
(B) 1. increase 2. transfer

2 (A) 1. False 2. True
3. False
(B) 1. Camouflage 2. Gravity

3 (A) 1. wood 2. structural
3. The passenger rushes forwards
(B)

Laila's walked	Sara's walked
Distance = 15 km	Distance = 20 km
Time taken = 3 hours	Time taken = 8 hours
Laila's walking speed	Sara's walking speed
$= \frac{Distance}{Time}$	$= \frac{Distance}{Time}$
Laila's walking speed	Sara's walking speed
$= \frac{15}{3} = 5$km/hour	$= \frac{20}{8} = 2.5$km/hours

So, Laila is walking faster than Sara.

4 (A) - At point (A), as the ball moves up , the kinetic energy transforms into potential energy
- At point (B), as the ball moves up , the kinetic energy transforms into potential energy and the ball stores a large amount of potential energy.
- At point (C), as the ball moves down, the stored potential energy transforms into kinetic energy.

(B) Due to the increase in the kinetic energy, the potential energy decreases.

Model 4

1 (A) 1. fur - feet 2. same
3. potential 4. electric - kinetic
(B) The car driver will...
- **Increase the speed** of the car by pushing (increasing force) on the gas pedal, causing the increase in the kinetic energy.
- **Decrease the speed** of the car by lifting-up his feet (decreasing force) from the gas pedal, causing the decrease in the kinetic energy.

2 (A) 1. True 2. False
3. False 4. False
(B) The tractor will cause severe damage to the car, due to its greater mass.

3 (A) 1. Static objects 2. different
(B) 1.Nocturnal animals 2. Collision
3. Distance

4 (A) 1. Wood
2. Acacia trees warn each other of danger to rid themselves of large herbivores (ex: Giraffes), by pumping toxic substances into their leaves in order to send signals to the other neighboring trees to prepare themselves.
3. Fuel in cars.

(B) The amount of energy depends on the kinetic energy of the moving sphere (determined by their speed & mass) & its direction of motion. So.....
- Most of the energy in the pendulum is transmitted to the other spheres (balls), some energies are lost in the form of sound energy, some are lost due to friction and the balls lose some energy by moving in the air.
- If the string is left for a while, and finally the balls will lose their kinetic energy & stop after lots of collisions.

Model 5

1 1. man interference
2. electric - kinetic
3. kilometer/hour – meter/minute
4. forward 5. increases

2 (A) 1. spinal nerve
2. The push increased her speed.
3. engine
(B) 1. False 2. False

3 (A) 1. Airbag 2. Potential energy
3. Transparent (material)
(B) - The nail's growth speed is 13 cm/year. (1)
- An airplane travels 400km/hour. (4)
- A man walks an average of 5km/hour. (2)
- A car travels 90km/hour. (3)

4 (A) 1. Red car: Distance = 240 km

Time taken = 2.5 hours

Red Car's speed = $\frac{Distance}{Time}$ =

$\frac{240}{2.5}$ = 96km/hour

2. White car: Distance = 240 km

Time taken = 3 hours

White Car's speed = $\frac{Distance}{Time}$ = $\frac{240}{3}$

= 80km/hour

(B) - **From the highest to the lowest speed**

Figure (B) ⟶ (1)

Figure (C) ⟶ (2)

Figure (A) ⟶ (3)

رقم الإيداع: 2021 / 23651

ترخيص وزارة التربية والتعليم رقم 165

